The integration of ICT in Hong Kong preschool settings: Case studies of two Hong Kong kindergartens

by

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Table of Contents

List of Tables

List of Figures

List of Appendices

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Abstract

Information and Communication Technologies (ICT) integration into kindergarten teachers' practice has received a mixed reception from practitioners. However, whether and how Hong Kong preschool teachers actually integrate ICT into their teaching practice is influenced by many factors. This study aimed to explore Hong Kong preschool teachers' views and the ways in which ICT are implemented into their teaching practices; it also intended to describe the teachers' level of technological, pedagogical and content knowledge (TPACK). An additional purpose was to reveal the challenges influencing preschool teachers' decision-making in relation to ICT usage. These challenges may possibly include lack of access to ICT resources, technical problems, lack of ICT training for preschool teachers and so forth.

To achieve these goals, the study applied two qualitative case study designs by using a focus group, non-participant observation and semi-structured interviews. The focus group was conducted with 15 preschool teachers. Observations of and semi-structured interviews with four teachers in two schools were utilized. Key themes from the findings were identified through thematic analysis. The study applied the TPACK framework to explore teachers' level of TPACK and their integration of ICT in preschool classrooms. The findings reveal that teachers were able to integrate ICT successfully into specific forms of activity, but to improve the quality of their lessons, it was necessary that they fit three components (curriculum, pedagogy and technology) together. In addition, they were willing to use ICT to facilitate students' learning and were clear about the role of ICT in the curriculum. However, in the two cases, there were some barriers affecting the fitting level of TPACK between the teachers: fund-raising problems, few resources, teacher training problems,

technical support and the teachers' competence in using ICT. Insufficient guidelines for teachers in the integration of ICT in preschool settings also discouraged teachers from using it in their classrooms. The study found that personal skills and institutional factors also affected how preschool teachers used ICT in their teaching practice. Hence, these findings suggest that policy makers, school leaders, teacher educators and educational institutions need to create good conditions and collaborate to assist preschool teachers effectively in exploring how to integrate ICT appropriately into early childhood education. The study also recommends the TPACK models should be introduced to preschool teachers by the educational institution or teacher educators.

CHAPTER 1 INTRODUCTION

People today live in a technological world where information is accessible anytime and anywhere. Information and communication technology (ICT) has become more essential and changed all aspects of children's life today (Edwards 2005). Recently, there has been a growth in research on the significance of ICT integrated into supporting children's learning (Plowman, Stephen and McPake 2010; Yelland 2007).

1.1 Definition of major terms

ICT: ICT stands for 'Information and Communication Technologies', a term that is very similar to another term, IT (Information Technology), which refers to storing and manipulating information in computers or other technologies. This term is not easily defined since there is no globally accepted definition of ICT, due to the fact that technology is rapidly changing. In education, as Gay and Blades (2005) suggest, ICT include an effective use of technological programs to connect, retrieve, convert, save, manipulate and transfer data and information. In this study, ICTs are defined as the computers and peripherals to encompass technologies that are better suited to the needs of young children.

Hong Kong Preschool: There are two types registered with the Education Bureau in Hong Kong: kindergartens and kindergarten-cum-child care centres, both providing services for children from three to six years old. Almost all children between three and six years of age are enrolled in various early childhood education services (Pearson and Rao 2003). Also, all kindergartens in Hong Kong are privately run. They can be categorized as non-profit-making (NPM) kindergartens (KGs)

and private independent (PI) KGs, depending on their sponsoring organizations, which can be either voluntary agencies or private enterprises. The goals of preschools in Hong Kong are to provide care and education. In this study, all the ECE educational sectors in Hong Kong are referred to as 'preschool'.

ICT integration: It is a dynamic, flexible and changeable process (Yildiz & Kocak, 2016). Thus, different definitions of it have been proposed (Yildiz & Kocak, 2016). Dockstader (1999) provides the following concise definition of technology integration:

> Technology integration is using computers effectively and efficiently in the general content areas to allow students to learn how to apply computer skills in meaningful ways. Discrete computer skills take on new meaning when they are integrated within the curriculum. Integration is incorporating technology in a manner that enhances student learning … Technology integration is having the curriculum drive technology usage, not having technology drive the curriculum. Finally, technology integration is organizing the goals of curriculum and technology into a coordinated, harmonious whole. (p. 73)

According to Hew & Brush (2007), ICT integration can be defined as "the use of technology as a means to fulfil the objectives and reinforce student learning through educational programme". Some researchers stated that integration of technology into teaching and learning can reinforce the learning environment to improve students' learning and this process will become a substantial component of education (Mishra and Koehler, 2008; Reigeluth & Karnopp, 2013; Watson, Watson & Reigeluth, 2012).

Thus, ICT integration means the appropriate use of technology in the classroom to expand, enrich, implement, individualize, differentiate and extend the

overall curriculum. When integrated, ICT can naturally and appropriately offer support through writing, software, hardware and other methods. To integrate ICT fully into the curriculum, teachers should observe the goals of the curriculum and find ways to implement ICT to achieve the goals. In this study, a broad definition from the position statement of the National Association for the Education of Young Children (2012) was adopted. ICT include both 'technology and interactive media':

> Technology tools, involving digital devices for communication, collaboration, social networking, and producing user-generated content, have transformed mainstream culture … Interactive media refers to applications (apps), broadcast streaming media, some children's television programming, e-books, the Internet, and other forms of content designed to facilitate active and creative use by young children and to encourage social engagement with other children and adults (NAEYC 2012, pp. 1- 2).

NAEYC: The National Association of the Education of Young Children is a non-profit partnership of educators, health professionals and other advocates who are concerned about the decline in children's health and well-being, and who share a sense that childhood itself is endangered. It is the leading accreditation organization in the early childhood field**.**

1.2 Significance of the study

Contemporary young children are part of the digital generation, and they are facing an environment with rapid changes of technology (Fleer 2011). ICT has become an integral part of their lives. Much previous research has explored primary, secondary school or university teachers' attitudes toward the usage of ICT in education (e.g., Karasavvidis 2009; Al-Senaidi, Lin and Poirot 2009). However, there are few studies that have focused on preschool teachers' views on or intentions to integrate technologies into early childhood

settings (Gialamas and Nikolopoulou 2010), despite its potential influence on learning. Moreover, there are a limited number of studies on the topic of ICT integration into early childhood settings, and thus a gap seems to exist between the trend of ICT educational use in preschool and how teachers use ICT in real classrooms (Ottenbreit-Leftwich et al. 2010; Chen and Chang 2006). No known study has examined these issues in Hong Kong. This study is significant as it raised the issue of the importance of finding out how preschool teachers integrate ICT into their classrooms.

As a teacher educator in one of the teacher training institutes based in Hong Kong, I have found that most of my students do not often integrate technology into their lessons for several major reasons: lack of financial resources, lack of training from institutes and schools, inadequate preparation time, lack of ICT teaching materials for local preschools and technical problems. Thus, the objectives of this study were to investigate how preschool teachers integrate ICT in their teaching, to discuss the significance of the factors affecting the implementation of ICT, and to make recommendations for future research. The findings of this study will provide information to Hong Kong preschool teachers who want to integrate ICT into their classrooms in developmentally appropriate ways, as well as to software designers who want to develop educationally meaningful applications (apps) for young children. Besides, teachers will gain insights into ICT integration and develop their knowledge about scaffolding young children's learning in order to support their knowledge construction through ICT.

1.3 Aims of the study and research questions

This qualitative study aimed to examine how Hong Kong preschool teachers use ICT in two Hong Kong kindergartens, focusing on the issues of teaching content, pedagogical approaches and technology adoption. To do so, it examined their ICT

implementation through the lens of published models - Technology pedagogical and content knowledge (TPCK). Barriers which influence preschool teachers using ICT in their teaching practice were also explored.

This research study explored this topic in depth, generating insights relevant to the field of early childhood education in Hong Kong. For that purpose, the main question of the research was as follows: What are teachers' views on integrating ICT into Hong Kong preschool teaching and learning?

Sub-questions of this research study were as follows:

1. How do Hong Kong preschool teachers describe and understand their roles of ICT in the teaching and learning process for young children?
2. What are teachers' perspectives on the institutional barriers influencing the implementation of ICT in preschool?

1.4 Summary

This chapter has given the foundation for the current study. The major terms in the research have been defined. Also, the significance of the research, the aims and research questions have been introduced. The next chapter, Chapter 2, presents a review of current literature and research related to the integration of ICT in young children's learning and the barriers that might influence the use of ICT in preschool.

CHAPTER 2 LITERATURE REVIEW

As noted in Chapter 1, the use of ICT has grown in importance in the field of early childhood education. This section examines (a) the background of ICT education, (b) arguments that have been made for implementing ICT at this level, (c) the theoretical underpinning of ICT in the preschool setting and (d) the barriers that previous studies have identified in relation to the implementation of ICT in early childhood education. In the second section, I provide a brief overview of the TPACK framework and explain the need for the current review.

2.1 ICT used in Hong Kong preschools

Beginning in the 1990s, national educational policies around the world mandated massive investments in information and communications technologies (ICT) to transform teaching and learning in ways appropriate for developing '21st-century skills' (Salehi and Salehi 2012). ICT have increasingly been integrated into all facets of life and society (Zhang and Aikman 2007). In the United Kingdom, the government spent £2.5 billion on educational ICT from 2008-09 (Nut 2010), and in New Zealand, the government spends over $410 million every year on schools' ICT infrastructure (Johnson, Calvert and Raggert 2009). In fact, a number of studies have argued that the use of new technologies in education is essential in the information age (Salehi and Salehi 2012). In order to maintain the competitiveness of Hong Kong's education and enhance the overall quality of teaching and learning in Hong Kong schools (alongside countries such as Singapore and Taiwan, which have strong ICT policies), the implementation of ICT initiatives in Hong Kong education became inevitable. Therefore, over the past two decades, the Hong Kong government has invested a vast amount of resources in ICT education development through four major IT

strategies (Education and Manpower Bureau 1998 2004; Education Bureau 2008). For the first policy, the Hong Kong government launched a 5-year plan to integrate ICT into the school curricula in late 1998 for primary and secondary schools (Li 2006) with 3.2 billion Hong Kong dollars allocated to the development and implementation of an IT strategy. Measures were employed to strengthen ICT development including the provision of network facilities, staff development and resources to all schools, except for preschools in Hong Kong, and to promote awareness of the new roles of teachers in the era of a technological society. In spite of a lack of support and guidelines from the government, most preschools have been able to emphasize the importance of ICT in teaching and learning.

The *Guide to Pre-Primary Curriculum* (Curriculum Development Council 2006) encapsulated the first detailed formal educational guidelines for preschool curriculum development, learning and teaching, assessment and ICT integration in the field of Hong Kong early childhood education. This document suggests integrating ICT into the early childhood curriculum to develop children's awareness of the value, benefits and even side effects of using ICT in daily life (Li 2006):

> Children gain a deeper understanding of the things and phenomena around them, and experience the joy of science and technology, through observation, exploration, questioning and verification. Many modern inventions, such as IT products (such as television, video recorders and computers), advanced means of transportation and objects that are easily accessible to children (such as electric fans and toys) … Children can learn and experience the close relationship between science, technology and living. (Curriculum Development Council 2006, p. 31)

This document also recommends that preschools should balance the time they spend on ICT with children's other daily activities:

> Time spent on using technological products (such as computers) as teaching aids should not be too long, so as not to hinder the overall teaching arrangements …

> over-dependence on technology will deprive children of the opportunities to learn from reality. (Curriculum Development Council 2006, p. 32)

Nevertheless, such guidelines are ambiguous and thus do not sufficiently support teachers in the integration of ICT in preschool settings. They do not mention how practitioners can use ICT at the preschool level. This document considers ICT to be a kind of product or resource that relates to children's daily lives, but gives no specific guidance for the pedagogical use of ICT in curricula. Therefore, preschool teachers must make the decision by themselves on how and what technologies to use in their teaching practices. In fact, the guidelines point out the potential negative impact of using ICT.

Furthermore, the Education Bureau has made efforts to upgrade the qualification of preschool teachers in recent years. All Hong Kong preschool teachers are required to obtain a Diploma in Early Childhood Education (ECE). More teachers have received, or are receiving, advanced training at degree level or above in recent years. In the government statistics report of 2013-2014 (Education Bureau 2015), 30% of practitioners held a bachelor's degree in ECE. Even though the number of preschool teachers with academic training is increasing, ICT training has been inadequate, and there are issues with the training accessed by preschool teachers.

In Hong Kong, a report on personal computers and Internet access in households by the Census and Statistics Department showed that there 79.9% of all households had a personal computer at home connected to the Internet. The percentage of households that had a PC at home increased from 67.5% in 2003 to 81.9% in 2013; the corresponding percentage of households having a PC at home connected to the Internet increased from 60.0% in 2003 to 79.9% in 2013 (Hong Kong Census and Statistics Department 2013).

Based on these data, it is reasonable to surmise that most children in Hong Kong have access to a personal computer. Thus, there is an urgent need for preschool teachers to identify and deliberate on appropriate ways of educating children with ICT, in order to prepare them to become future citizens in the information age.

2.2 Arguments for implementing ICT in the early childhood educational setting

The influence of young children's use of technologies on their development is still controversial (Geist 2012; Plowman and McPake 2012; Yelland 2011). Computer literacy and skills are increasingly important in the information era (Colker 2011; Grey 2011; McCarrick and Li 2007) where students' capabilities for managing technology are becoming more necessary (Lim 2012). However, Mohammad and Mohammad (2012) remind us that we live in a world dominated by computer technology, and computers have begun to appear in schools, even at the preschool level.

Integration of ICT in the Early Childhood Education curriculum is necessary to enhance the overall development of young children (Lim 2012; Yelland 2011). ICT activities can promote children's critical thinking, problem solving decision-making skills, creativity, language and social abilities, and their self-esteem (Maynard 2010; NAEYC 2012; Yelland 2005). Thus, ICT can be used for a broad range of purposes in young children's learning. Baytak (2011) states,

> Most students feel their learning are improved by integrating technology into their learning. Therefore, educational technologies, specifically computer and the Internet technologies, have inevitably become powerful in the classroom as they change the way we teach and learn. As technology makes learning more interesting, enjoyable and interactive, kids today love learning by doing, discovering, and interacting. (p. 147)

Moreover, a variety of technologies could enhance children's collaboration and interaction with peers. For instance, Infante et al. (2010) found that a video game designed for multiple players using one computer screen and several input devices encouraged kindergarteners to collaborate and communicate in order to complete the game tasks. Besides, technology is widely used as communication tools, such as email, mobile phone and web cameras. Thus, the use of these ICT may contribute to enhance children's communication skills (McCarrick and Li 2007).

In contrast, some authors have claimed that ICT use is not appropriate for young children's cognitive, physical, social and emotional development (Ministry of Education 2005). For example, computer technology might isolate young children and impede their social development (Armstrong and Casement 2000; The Alliance for Childhood 2004). Additionally, Wolfe and Flewitt's (2012) study found that most of the participating parents and teachers were concerned that children's frequent use of technology may impede all areas of development. Thus, these adults restricted the time their children spend on using computers or did not encourage or facilitate children's use of technology.

Others, however, argue that young children are more likely to interact positively in the computer area[1] in the preschool classroom (Maynard 2010; Zevenbergen 2007; Lim 2012). Specifically, when used appropriately, technology or software serves as a catalyst for social interaction, encouraging reading and conversations with and among children (Nikolopoulou 2007). In addition, some authors noted that ICT can be a useful tool for supporting young children's learning and development (Siraj-Blatchford and Whitebread

[1] Learning areas are common in Hong Kong preschools which are workstations for specific activities, for example, maths areas, language area, reading area or family area, and so forth.

2006). Findings from Hatzigianni and Margetts (2012) suggest that computer use can enhance computer self-esteem,[2] especially for children with access to computers both at home and in preschool during the first year of schooling. When using computers, children feel that they are imitating adults, and they feel proud of themselves when they can display their accomplishments and receive appreciation and compliments for something 'the grown ups can do' (Moore 2005). Also, adults can help assure age and developmentally appropriate use of ICT by young children. Computers and digital toys are valuable for children's learning when used correctly because they encourage self-motivation, allow for student input, are challenging and exciting, and can lead to learning about the world (Johnson and Christie 2009).

Additionally, The Alliance for Childhood (2012) urged the NAEYC to take a strong stand on limiting screen time in the lives of young children, reasoning that the erosion of creative play and interaction with caring adults will arise from too much screen time. Screens take time away from children's interaction with caring adults. Even when parents co-view television with children, they spend less time engaged in other activities with their children (Vandewater, Bickham and Lee 2006). New technologies will interfere with parent-child conversations (The Alliance for Childhood 2012). For example, parents may talk less to their children when they are watching television. Even though offering a screen-free setting is a valid and pedagogically sound choice (The Alliance for Childhood 2012), students also need time for hands-on creative play, physically active play, and give-and-take interactions with other children and adults. They benefit from a connection with nature

[2]Computer self-esteem was defined as children's sense of worth concerning their abilities to use computers (Margetts 2012).

and opportunities to initiate explorations of their world (The Alliance for Childhood 2012).

Therefore, the Alliance recommends

1. Early childhood professionals need to be well-informed about the implications of screen technologies for young children. Courses and professional development programmes that help teachers and caregivers actively examine the pros, cons, and implications of screen technologies for their work with children should be encouraged.
2. Make intentional decisions about technology. If you use technology in the classroom, understand why and what you hope to accomplish with it. If you do not use it, understand why you are making that choice.
3. Keep in mind that choosing to be screen-free is a viable option. As with all your classroom decisions, what you decide about technology should be based on what your particular children really need. While the use of technology in early childhood settings is increasingly common, choosing a screen-free, play-based setting for young children remains a pedagogically sound choice.
4. Work closely with parents. Knowing how much time children spend looking at screens at home and the nature of the content they are experiencing is central to making an informed decision about screen technologies in your classroom.
5. Remember to keep settings for infants and toddlers screen-free and to set developmentally appropriate time limits for older children. For young children over 3, the public health recommendation of no more than 1 to 2 hours a day is more than enough for total screen time. (The Alliance for Childhood 2012)

Even such viewpoints acknowledge that ICT should be integrated into early childhood settings. Furthermore, the integration of ICT into the early childhood curriculum was and is still supported by research findings and early childhood institutions (Mohammad and Mohammad 2012). For example, the NAEYC supports the integration of computers in early childhood classrooms. In their position statement (2012), their main viewpoint likens to that of the Alliance for Childhood's (1996) position statement regarding the appropriateness of technology use with young children.

2.3 Theoretical background of integrating ICT in the preschool setting

(i) Developmentally appropriate integration of ICT into early childhood settings

There are some early childhood institutions that support the integration of ICT into the early childhood curriculum. As noted above, the NAEYC has been supportive and provided guidelines for the integration of computers into early childhood classrooms. It published a position statement 'Technology and Young Children: Ages 3 through 8' (1996), arguing that the appropriate use of ICT can support and extend traditional materials in valuable ways.

In order to integrate computers successfully into the early childhood curriculum, preschool educators must be knowledgeable about children and familiar with theories of how children learn. Regarding the appropriateness of technology use with young children, the NAEYC states

> The potential benefits of technology for young children's learning and development are well documented … the research indicates that, in practice, computers supplement and do not replace highly valued early childhood activities and materials, such as art, blocks, sand, water, books, explorations with writing materials, and dramatic play. (p. 11)

The statement clearly indicates that computer use must not replace 'concrete' real-world learning activities, such as block play and socio-dramatic play. Therefore, teachers should be encouraged to set up scenarios in which computer activity is open-ended and collaborative, providing meaningful experiences for young children.

In addition, ICT has a great potential to enhance student achievement, but only if it is used appropriately (Dede 1998). Siraj-Blatchford and Whitebread (2003) proposed the guidelines identified by the Developmentally Appropriate Technology in Early Childhood (DATEC) project, which provides eight general principles about the

developmentally appropriate use of ICT in the early years for practitioners as a useful framework. All of these principles are important in responding to the sub-questions of my study, and they are listed below:

- Take a learner-centred approach
- Uphold the principles of Te Whāriki[3]
- Be led by and share good practice and research
- Maximize opportunities for collaboration and innovation
- Encourage sustainability and affordability
- Recognize and address issues of safety and appropriateness

(Ministry of Education, New Zealand 2005, p.6-7)

As highlighted by Mohammad and Mohammad (2006 and 2012), computers can become a significant tool encouraging young children to explore and discover, if they are accompanied by a caring, knowledgeable teacher who chooses developmentally appropriate software, encourages students' interaction and provides books that support the theme.

Similarly, the development of technologies-integrated curricula is developmentally appropriate for young children to meet their developmental needs and help to bridge their digital experiences at home and in school (McKenney and Voogt 2009; Plowan, Stevenson, McPake, Stephen and Adey 2011). That is, the integration of ICT into the early childhood curriculum must be appropriate and meaningful for young children and must meet 'the development levels, abilities, needs, and interests and the curriculum' (Eassa 1999, p. 208). Consequently, the integration of different media into this process is still the responsibility of preschool teachers, and they have a critical role in using technological devices, choosing

[3] Te Whāriki is the Ministry of Education's early childhood curriculum policy statement. Te Whāriki is a framework for providing tamariki/children's early learning and development within a sociocultural context.

acceptable software and observing children to make it developmentally appropriate (Heinich et al. 1999; NAEYC 2012).

A joint position statement, *Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8*, issued by the National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College (2012), builds upon the guiding principles of the 1996 statement (NAEYC 1996) by expanding the age range from ages 3 to 8 to now include birth to 3; encompassing a broader definition of technology; and adding emphasis on technological and media literacy. The joint position statement offers teachers a framework to guide educators in making decisions in the use of technology and interactive media tools with young children and evaluation of technology tools and screen media in early childhood settings serving children from birth to age 8:

> Effective uses of technology and media are active, hands-on, engaging, and empowering; give the child control; provide adaptive scaffolds to facilitate the accomplishment of tasks; and are used as one of the many options to support children's learning. To align and integrate technology and media with other core experiences and opportunities, young children need tools that help them explore, create, problem solve, consider, think, listen and view critically, make decisions, observe, document, research, investigate ideas, demonstrate learning, take turns, and learn with and from one another. (NAEYC 2012, p. 6)

These positions gave me a framework to look at the integration of ICT into the ECE curriculum. First, preschool practitioners should select, use, integrate, and evaluate technology and interactive media in intentional and developmentally appropriate ways, focusing on the appropriateness and quality of the engagement. Second, a balanced curriculum for young children should be provided. Thirdly, equitable access to technology and interactive media experiences for children and their families should be ensured. Last

but not least, preschool teachers should understand the limits of technology and give careful consideration to public health concerns. After all, the use of computer technology has become commonplace in today's world. Children as young as three years of age are being exposed to computers and the Internet. Since at such a young age children are still developing socially, emotionally, and cognitively, it is essential that the technology they use is developmentally appropriate (Ntuli and Kyei-Blankson 2010).

In addition, Ntuli and Kyei-Blankson (2010) examine the early childhood teacher perceptions of what constitutes developmentally appropriate technology, their understandings of the role of such technology in the teaching and learning process, and their extent of use of such technology in their classrooms. In their study, they found that most preschoolers' understanding or perceptions did not transfer to their levels of use with technology in the classroom. Most teachers suggested that their level of technology integration into teaching and learning was below average. That means they were not very familiar with integrating ICT into their curriculum. Hence, teachers should find ways to improve the level of use and collect more assessment data if they are going to find out whether their students are benefiting at all from the use of technology at the early childhood level.

Bers (2010) shows what young children can do with age-appropriate technology. In her studies, she works with young children and their families, in some cases designing robots with specific functions. This involves being engaged with powerful ideas in order to instruct the robots to act. Her research extends the work begun by Papert (1993) illustrating that, when young children are engaged and challenged, they are able to work with sophisticated ideas and communicate their understandings via new technologies. The

importance of this finding for planning an early childhood curriculum is significant (Bers 2010).

Similarly, in a study of preschoolers, Yelland (2005) found that digital media-based activities in school settings can engage children in collaborative learning, reasoning, and problem-solving activities that had been thought too sophisticated for them to understand and carry out. She demonstrates that digital media are now being integrated into hands-on materials that facilitate learning through the programming and use of digitally manipulative objects, such as programmable Lego bricks and digital beads.

Overall, the use of ICT as an integrated part of the early childhood curriculum is vital for the world (Yelland 2011; Gialams and Nikolopoulou 2010; Lin 2010). Based on the above literature, appropriate use of ICT in the pre-school curriculum should be enhanced and thus some guidelines should be provided for preschool teachers to assist them in integrating computers into the classroom to promote children's overall development.

(ii) Sociocultural theory

Developmental appropriateness has strong links to Piagetian theory and more recently to the social constructive views of Vygotsky. Vygotsky's theories stress the fundamental role of social interaction in the development of cognition (Vygotsky 1978), and thus community plays a central role in the process of 'making meaning'. Socioculturalists consider learning to be a social activity and that interactions are key to making meaning (Mitchell and Myles 2004). The learner's interaction with materials and activities occurs primarily in the social context of relationships. According to Vygotsky, higher mental functions appear twice in development, first at the 'interpsychological' or social level and then at the 'intrapsychological' or individual level. Hence, in Vygotsky's

theory, children's construction process is socially mediated (Cobb 1996). Specifically, it is essential for cognitive development that young children learn something not by themselves, but by interacting with others, friends and adults (Lim 2012). In other words, while teachers and children act and talk together, minds are under constant construction, especially for the novice and the young who, through the transition from inter-psychological to intra-psychological, plan to take over and internalize the joint functioning to form an individual cognitive process (Vygotsky 1978).

Vygotsky argues that children cannot develop purely abstract models of thought without instruction in abstract sign systems. Closely related to this argument, Vygotsky proposes a significant conception in his theory: the zone of proximal development (ZPD) (Vygotsky 2004). According to this concept, a learner requires support and help from a teacher or a more knowledgeable peer so as to achieve an understanding of new knowledge (Shabani, Khatib, and Ebadi 2010). The ZPD refers to 'the distance between children's independent performance, the level at which children can perform alone or unassisted, and children's assisted performance, the assistance provided by adults or more competent peers' (Vygotsky 1978, p. 86). For example, once a student is at the ZPD for a particular task, providing the appropriate assistance will give the student enough of a 'scaffolding' to achieve the task.

The above theories stress that learning is not a one-way communication process where teachers deliver knowledge to students. According to Vygotsky's theory, young children learn something not by themselves, but by interacting with others, friends and adults. ICT learning with small groups of children encourages teamwork and collaboration, therefore contributing to forming positive peer relationships (Infante et al. 2010). On these grounds, active learners play a key part in the mutual relationships and interaction between

people and behaviour and social environment. Evidence from Kenner et al.'s (2008) research indicates that 3- to 6-year-old grandchildren and their grandparents help each other in computer activities. As the children taught teach their grandparents how to play a computer game, the grandparents helped the children with the linguistic and cultural knowledge needed to play the game. From this study, it is clear that computer activities are able to facilitate and reinforce children's learning through the interaction with family adults.

In a similar vein, some scholars' research (e.g., Hyun and Davis 2005; Dillenbourg and Evans 2011, Roschelle and Teasley 1995) draws upon the theoretical construct of sociocultural perspectives. Hyun and Davis (2005) explored 5- to 6-year-old kindergarteners' conversations and inquiries with computers in a technology-rich classroom. Young children tended to ask educationally meaningful questions that emerge through computer activity and interaction with their peers at the computer. Besides, Dillenbourg and Evans (2011) propose that interactive tabletops in education can enable educationally meaningful experiences through multiple modes of communication in the computer learning environment (Dillenbourg and Evan 2011).

Roschelle and Teasley's study (1995) claims that students are more likely to interact with each other when working collaboratively in a computer area in the classroom for students to explore their thinking collaboratively. In addition, they have more opportunity to experience meaningful knowledge construction through computer-supported collaborative learning activities. Likewise, some research has shown that collaborative learning and social interaction skills can be enhanced with well-designed digital technology (Bers, New and Boudreau 2006; Freeman and Somerindyke 2001). For example, Yelland (2005) finds that digital media-based activities in school settings can engage children in

collaborative learning, reasoning, and problem-solving activities that had been thought to be too sophisticated for them to understand and carry out at very young ages.

Vygotsky (1986) notes that the social environment is an integral part of the cognitive change process. For the constructivist, each individual learner constructs his or her own knowledge through active interaction with the environment and people. It is possible that computer technology could encourage more interaction between learners if they have an opportunity to experience meaningful knowledge construction through computer-supported collaborative learning activities. Some research shows that collaborative learning and social interaction skills can be enhanced with well-designed digital technology (Bers, New and Boudreau 2006).

(iii) ICT and play

Developing and learning through play has become a well-known concept in early childhood education (Singer, Golinkoff and Hirsh-Pasek 2006). Unlike other levels of education, ECE has a distinct culture with an emphasis on learning through play (Plowman, Stephen and McPake 2010). In Western societies play is considered synonymous with learning (Yelland 2011). Cognitive theorists also have stressed children's cognitive development. According to Piaget (1962), children experience different stages of cognitive development at different ages. They engage in the types of play that match their current cognitive developmental level (Saracho and Spodek 1995).

Existing literature indicates that play as a pedagogy is espoused by programmes based on Developmentally Appropriate Practice (DAP), and play-based early childhood programmes (Yelland 2011). Johnson and Christie (2009) found that digital technology can be appropriate in early childhood education to foster positive play and child

development. They suggest that children need a balance between screen play and actual play. Moreover, parents and teachers can help assure that the technology is age and developmentally appropriate for young children (Johnson and Christie 2009).

From a socio-cultural perspective, there is substantial evidence (e.g., Mayall, 2001; Kallinala 2006; Bretherton 2014; Yelland 2011) that through play, children demonstrate improved verbal communication, high levels of social and interactive sills, creative use of play materials, imaginative and divergent thinking skills, and problem-solving capabilities. Play and playful forms of activity potentially lead towards increasingly mature forms of knowledge, skill and understanding (Moyles and Adams 2001). Vygotsky views play as an activity that leads development forward, contributing significantly to children's capacity to engage in planned and self-regulatory activities (Berk and Winsler 1995). He believes that this occurs in interactions with others before being internalized by individuals; thus, contextual learning is of paramount importance.

Similarly, Leung (2011) shows that children are highly motivated while playing computer games during their free playtime after they finish their regular classwork or homework. In kindergartens, the computer is typically used during the time that is organized as free play (Ljung-Djärf 2008). As a consequence, preschool teachers need to capitalize on children's general interest with technology by embedding technological tools in the curriculum to extend children's interaction, exploration and perspective.

However, Yelland (2011) argues that digital technologies in the early years are still not fully integrated with pedagogical perspectives on play. This issue is reflected in different international curriculum documents, which is separate from the concept of play as a basis for pedagogy from their reference to children's uses of technologies for communication or creative purposes. England's Statutory Framework for the Early Years

Foundation Stage (Department for Education 2012) and the Swedish National Agency for Education (2010) are examples of curricula that discuss play and children's learning; however, ICT are listed separately from descriptions of children learning through play (Edwards 2013). This means it is very difficult for play to be appropriately integrated into the early childhood curriculum because play is not understood in digital terms.

2.4 **Barriers to using ICT in schools**

(i) BECTA report

The 2004 British Educational Communications and Technology Agency (BECTA) report collates evidence from a range of sources on the actual and perceived barriers to teacher uptake of ICT. It draws on the literature associated with teachers' use of ICT and on a small-scale teacher survey. The key findings of this report include the following:

> (1) Confidence, time and access to quality resources are major factors in determining teachers' engagement with ICT;
> (2) Recurring technical faults and the expectation of faults occurring during teaching sessions are likely to reduce teacher confidence, causing teachers to avoid using the technology in future lessons;
> (3) Resistance to change is a factor that prevents the full integration of ICT in the classroom. In particular, teachers who do not realize the advantages of using technology in their teaching are less likely to make use of ICT;
> (4) There are close relationships between many of the identified barriers to ICT use; any factor influencing one barrier is likely to influence several other barriers. For example, teacher confidence is directly affected by levels of personal access to ICT, levels of technical support and the quality of training available. (BECTA 2004, pp. 3-4)

Khan, Hasan and Che (2012) point out that some researchers classify the barriers into two major categories: extrinsic and intrinsic barriers. Other authors refer to two types of barriers: the external (first-order), such as limited resources or lack of technical support,

and the internal (second-order), which include teachers' attitudes to ICT (Keengwe et al. 2008). The barriers identified in the literature can therefore be grouped as in Table 2.1:

External barriers	Internal barriers
● Lack of access to resources ● Lack of time ● Lack of effective training ● Technical problems ● Pressure from parents	● Lack of confidence ● Resistance to change and negative attitudes ● No perception of benefits

Table 2.1: Information taken from BECTA (2004)

An alternative way of grouping the barriers is to consider whether they relate to the individual (teacher-level barriers) or to the institution (school-level barriers) (table 2.2).

School-level barriers	Teacher-level barriers
• Lack of time • Lack of access to resources (lack of hardware, inappropriate organization, poor quality software) • Lack of effective training • Technical problems	• Lack of time • Lack of confidence • Resistance to change and negative attitudes. No perception of benefits • Lack of access to resources (personal / home access)

Table 2.2: Information taken from BECTA (2004)

(ii) Internal factors influencing preschool teachers' integration of ICT

Some scholars (e.g., Russell and Bradley 1997; Cuban 2011) indicate that the ICT barriers are evident and obvious, and that there are some common barriers that exist: lack of ICT skills, lack of infrastructure, lack of time, lack of institutional support, lack of available technical staff, lack of training and difficulty of ICT integration into technology.

Teachers' attitudes towards technology greatly influence their integration of ICT into their teaching. According to Russell and Bradley (1997), anxiety, lack of confidence, competence and fear often makes ICT take a back seat to conventional learning mechanisms. Cuban (2001) notes that preschool practitioners tend to perpetuate existing working methods, even as they accommodate new technologies, such as computers. The attitudes of teachers towards technology greatly influence their adoption and integration of computers into their teaching. In addition, the school renewal project focused on multiliteracies and

communication, requiring active involvement with computers and ICT. These are areas in which many early childhood teachers feel less than comfortable (see Yelland 1999).

As highlighted by Ertmer (2005), teachers' pedagogical beliefs are a major factor in the integration of technology into classroom teaching and learning. Ljung-Djärf (2008) shares a similar stance, finding that preschool teachers from three Swedish preschools believe that computer use is valuable to young children, but at the same time, it should be restricted. They regarded computer use as a threat to other more important activities, both planned (e.g., circle time) and unstructured (e.g., free play).

A Yuksel et al. (2008) study highlights how technology has been identified as supporting children's desire for knowledge. Nevertheless, teachers had some complaints regarding issues such as excessive usage, addition of some software and some health problems (Yuksel et al. 2008). A lack of knowledge about computers significantly affects Korean teacher decisions about technology use (Park et al. 2009; Liu 2011).

Research by Laffey (2004) indicates a similar trend, where pre-service teachers felt competent with their own skills, but did not feel comfortable with integrating the technology into their curriculum unless they had actually seen it being implemented and integrated by other educators in their classrooms. Some teachers are concerned that the computer may be used as a babysitter (Jonsson 1998), so computers in preschool are typically used during the time that is organized as free play. In Tsitouridou and Vryzas' (2004) study, the teachers who had reservations about introducing computers in the kindergarten listed, among others, these reasons: their own lack of knowledge about and experience with computers, and the possible adverse effects they could have on children.

(iii) External factors influencing preschool teachers' integration of ICT

Ihmeideh (2009) found that the lack of instructional software, funds, ICT skills and time are major barriers to ICT utilization in Jordanian pre-school settings. Moreover, shortage of class time is another significant barrier discouraging teachers from using ICT in the classroom (Liu 2011). Afshari, Bakar and Su-Luan et al. (2009) state that efficient and effective use of technology depends on the availability of hardware and software, as well as the equity of access to resources by teachers, students and administrative staff.

Joshi and his co-workers' (2010) research on kindergarten teachers in the United States and Japan examined their beliefs about the role of computers in educating young children. Respondents from both countries identified a lack of resources and clear guidelines for integrating computers into the classroom as major challenges. Some of them expressed that they were uncomfortable with computers and technology. Findings also highlight the need for training of early childhood teachers for integrating and using computers in the classroom.

In addition, Leung (2011) found that the educational software purchased from commercial companies and the computer activities included in educational platforms are very structured and not conducive to encouraging children's creativity, thinking and problem solving. In these circumstances, teachers should choose appropriate educational software that encourages children to remain in control of their learning.

Teachers who have received training in the use of computers in education have positive attitudes toward the contribution of computers to the skill development of young child in the intellectual, socio-emotional, psycho-motor and aesthetic fields (Tsitouridou and Vryzas 2004). Besides, professional technology training is also an important factor

behind the successful integration of computers into classroom teaching, as Mueller et al. (2008) have found. Their study shows that professional development and the continuing support of good practice are among the greatest determinants of successful ICT integration. Inadequate training is another barrier, as Hughes (2008) maintains in a discussion on how teachers need to learn to teach technology to students, and this contention is supported by research by Jones, Bennett and Lockyer (2009) on the challenges in the design process for teaching technology integration in courses. Jones, Bennett and Lockyer (2009) emphasize that integrating technology is a challenge in the design process. Hence, teachers need training in order to teach technology to students.

In addition, insufficient technical support in schools and little access to the Internet and ICT are considered the major barriers preventing teachers from integrating ICT into the curriculum, as Salehi and Salehi (2012) show. Their findings indicate that, although teachers have a strong desire to use ICT in the classroom, they encounter barriers. One of the barriers is shortage of class time. In Sicilia's study (2005), technical problems were found to be a major barrier for teachers. These technical barriers include waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers and teachers having to work on old computers. Without good technical support in the classroom, teachers cannot be expected to overcome the challenges.

2.5 Technology Pedagogical Content Knowledge (TPACK)

In this section, Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) will be framed to be a theoretical framework. I discuss the challenge of using ICT in preschool and why I should choose the TPACK framework; then, I introduce and delineate the various constructs of TPACK.

(i) The challenges of teaching with ICT in preschool

There is strong evidence that teacher quality is a crucial factor in achieving remarkable learning outcomes for students (Hsueh-Hua Chuang and Chao-Ju 2011). Meanwhile, ICT is rapidly adopting a predominant role in different educational systems, which have increased their investments both in computer hardware/software and ICT infrastructure (Hsueh-Hua Chuang and Chao-Ju 2011). However, newer digital technologies which are protean, unstable and opaque present new challenges to teachers who are struggling to use more technology in their instruction (Koehler, Mishra, and Cain 2013).

Moreover, many preschool teachers earned degrees at a time when educational technology was at a very different stage of development than it is today, and they often have been provided with inadequate training (Koehler et al. 2013). Most who graduated prior to 2005 do not have the technological knowledge and experience necessary to teach students properly because they did not grow up immersed in a technological teaching and learning environment (Prensky 2001). Thus it is not surprising that they do not consider themselves sufficiently prepared to use technology in the classroom and often do not appreciate its value or relevance to teaching and learning (Koehler et al. 2013).

The literature from the previous chapter reveals that there are many barriers to ICT integration in preschool educational environments. Some of the reasons are teachers' lack of technology competency, self-efficiency and negative attitudes towards technology use. Others are related to learning environments such as lack of technological tools, technical support and lack of ICT teaching materials (Ceylan, Tür, Yama, and KabakÇi Yurdakul 2014). Some literature proposes that technology should not be integrated into young children's learning. If the stance of no technology is adopted for early childhood, the

enhancement of teachers' TPACK will be a non-issue. However, my study assumes that ICT has permeated all aspects of children's daily life and plays an unquestionable role in their life.

(ii.) Why TPACK? Why not?

The challenges of teaching with technology were mentioned in the literature review chapter—for example, unsupportive social and institutional contexts, as well as inadequate experience with using digital technologies for teaching. What is needed is an approach to thinking about technology integration as an interaction between what teachers know and how they apply this knowledge in their classrooms. Effective ICT implementation requires teachers to have a coherent understanding of how ICT can be used combined with knowledge of subject matter and teaching strategies. The TPACK model provides this combined understanding.

Technological Pedagogical Content Knowledge (TPACK) refers to the synthesized form of knowledge for the purpose of integrating ICT/educational technology into classroom teaching and learning. In recent years, TPACK has been introduced as a framework for helping and guiding preschool teachers and teacher educators to make sense of the knowledge needed for technology integration in the classroom (Jyh-Chong Liang, Ching et al. 2013; Mishra and Koehler 2006). This framework has become a popular construct for examining the types of teacher knowledge needed to achieve technology integration (Brantley-Dias and Ertmer 2013).

The notion of TPACK is quickly becoming ubiquitous within the educational technology community, gaining popularity among researchers and practitioners alike

(Archambault and Barnett 2010). Currently, at TPACK.org,[4] the TPACK user community has compiled a growing bibliography of TPACK-related literature (443 articles as of this writing) (Korhler et al. 2013).

Besides, there is a substantial body of research on technology use with young children in the early childhood classroom (Hsueh and Chao 2011). A recent review by Chai, Koh and Tsai (2013) indicates that, despite the many papers written on TPACK, very little has been done on the application of this framework in preschool education. In fact, there is a lack of recent research studies aiming to provide a whole picture of teachers' TPCK in early childhood education. Therefore, this study investigated the level of preschool teachers' TPACK to inform the development guidelines for Hong Kong early childhood educators to contribute knowledge within this field of study. Once teachers are able to design TPACK integrated lessons, students' learning could be enhanced (Chai, Koh and Tsai 2013).

In the digital age, teachers encounter digital natives in the classrooms of young children. Thus, the pedagogies that teachers use can be insufficient and need to be changed (Loveland 2012). Thus, the TPACK framework can be a flexible model to decide to support decisions about which pedagogies should use technology in which context.

(iii) Delimiting TPACK and its constituents

Originally, this framework builds on Lee Shulman's pedagogical content knowledge theory. Thus, in order to understand the origins of the TPACK framework and its impact on the field of educational technology, it is necessary to examine its roots in pedagogical content knowledge (PCK). In the mid-1980s, Shulman (1986) developed the idea of PCK to illustrate the complex relationship between the amount and organization of knowledge of

[4] TPACK.org (http://tpack.org/) is an active repository of news and information about TPACK.

a particular subject matter (content) and the knowledge related to how to teach various content (pedagogy). Traditionally, teachers have been trained separately in their content area knowledge (science, history, and so on) and in teaching strategies. With his theory of PCK, Shulman (1987) asserts the importance, not only of developing a knowledge base in each of these areas, but also of the intersection and synergy of the two.

The development of the notion of Technological Pedagogical Content Knowledge (TPCK) provides a useful theoretical framework to explore the requisite forms of teacher knowledge required to integrate technology effectively in classroom work. According to Shulman (1987), PCK includes knowledge on how to teach a specific content or subject-matter knowledge, extending beyond simply knowing the content alone (Archambault and Barnett 2010). His intent was to draw attention to the importance of both content knowledge and pedagogical in order to illustrate how intertwined these two types of knowledge were:

> The … knowledge base of teaching lies at the intersection of content and pedagogy, in the capacity of a teacher to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students. (Shulman 1987, p. 15) (see Figure 2.1)

In other words, teachers should also possess knowledge regarding how to integrate content with appropriate pedagogical approaches, enabling them to represent the content of the subject matter to specific groups of students, who then master the subject matter at hand. He also says that experienced teachers draw on a broad and deep knowledge of their subject, an understanding of effective ways to represent the content knowledge, and an awareness of appropriate pedagogical approaches to inform their instruction (Hofer et al. 2008).

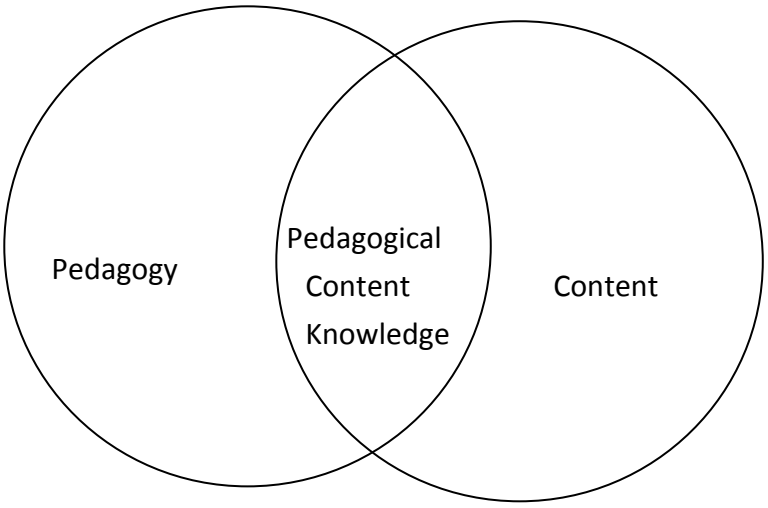

Figure 2.1. *Pedagogical Content Knowledge (Shulman 1987)*

Mishra and Koehler (2006, 2008) draw on Shulman's (1986, 1987) pedagogical content knowledge (PCK) construct, which includes technology as an influential factor in quality classroom instruction, to create a framework called TPCK (Fransson and Holmberg 2012; Voogt el al. 2013). The theory recognizes the complex interrelationship among the different elements, and 'describes how teachers' understandings of technology, pedagogy, and content can interact with one another to produce effective discipline-based teaching with ICT' (Shin et al. 2009, p. 1). In 2007, Thompson and Mishra modified the TPCK acronym to TPACK. According to Thompson and Mishra (2007), the new acronym, TPACK, is easier to pronounce and remember. Additionally, TPACK emphasizes that there are actually three kinds of knowledge (technology, pedagogy and content) as a more integrated whole (Thompson and Mishra 2007).

This TPACK model is used as a way to represent how teachers understand the connections and interactions among content knowledge (subject matter that is to be taught),

technological knowledge (computers, the Internet, digital video, and so forth), and pedagogical knowledge (practices, processes, strategies, procedures, and methods of teaching and learning) to improve student learning (Koehler and Mishra 2006). It refers to teaching a certain topic with pedagogical techniques by technology that provides learning experiences to students (Mishra and Koehler 2006; Matherson 2013). TPACK adds one layer to teacher knowledge: the knowledge of a technological tool. It is the effective use of the technology within a teaching strategy as a pedagogical tool. Thus, this notion has been rapidly extended across the fields of professional development and the development of technology integration curriculum. Swenson, Rozema, Young, McGrail and Whitin (2005) indicate that such a framework 'involves asking how technology can support and expand effective teaching and learning within the discipline, while simultaneously adjusting to the changes in content and pedagogy that technology by its very nature brings about' (p. 222).

Seven components are included in the TPACK framework: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological knowledge (TCK), technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK) (Mishra and Koehler 2006). The inclusion of technological knowledge (TK) gives rise to three new dimensions, namely TPK, TCK and TPCK, and productive technological integration in teaching considers all three spheres not in isolation but rather as interrelated. Below (Figure 2.2) is the TPACK framework taken from Koehler and Mishra (2008).

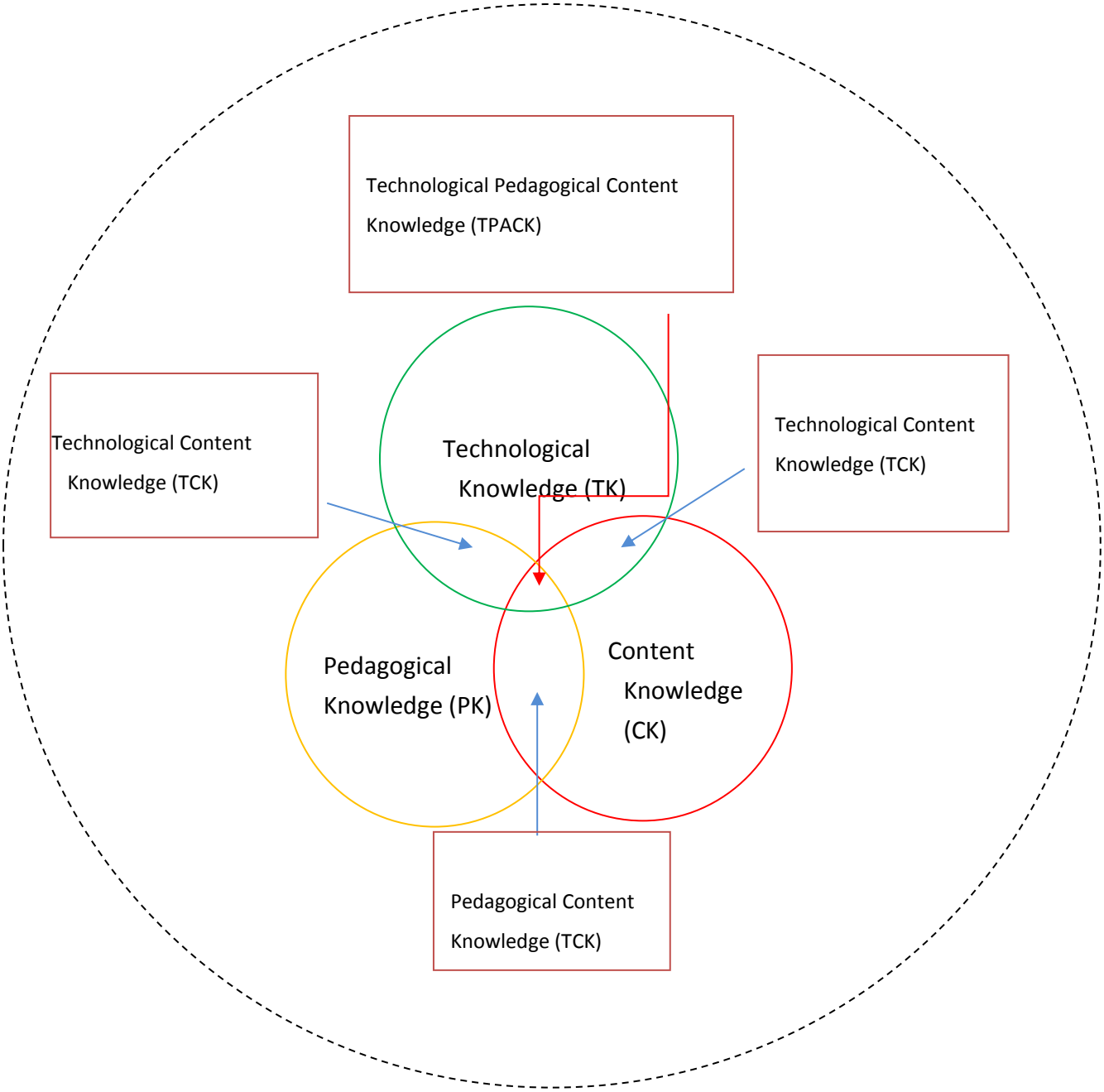

Figure 2.2 *The Mishra and Koehler Model*

The TPACK model is a complex form of knowledge shaped by a large number of contextual factors (such as school organization, curricula, students' socioeconomic backgrounds and technology) (Fransson and Holmberg 2012). To obtain the greatest understanding and manipulation of effectiveness, each component should be understood individually and in pairs as thoroughly as possible: pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPCK) (Mishra and Koehler 2006; Matherson 2013).

Table 2.3 below attempts to provide a succinct definition of each construct accompanied by examples from a range of academic sources (e.g. Mishra and Koehler 2006; Mishra and Koehler 2008; Fransson and Holmberg 2012).

TPACK Constructs	**Definition**	**Example**
TK	Knowledge about how to use ICT hardware and software and associated peripherals. This involves the skills required to operate particular technologies (Mishra and Koehler 2006). However, since technology is continually changing. Consequently, they updated their definition to define TK as a developed technology literacy where an individual can broadly apply technology productively to his or her everyday life and recognize where technology can assist or impede achieving a goal (Koehler and Mishra 2009, p.64).	Knowledge about how to use Web 2.0 tools (e.g., Wiki, Blog, Facebook), digital video, interactive whiteboards and educational software programs.

PK	Teachers' deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This generic form of knowledge applies to understanding how students learn, general classroom management skills, lesson planning, and student assessment (Koehler and Mishra 2009).	Knowledge about how to use problem-based learning (PBL) in teaching.
CK	Content knowledge refers to the actual subject or content matter that is to be learned or taught (Mishra and Koehler 2006). Teachers must know the content well to teach in various content areas (knowledge of central facts, concepts, theories, and procedures). Teachers must have a comprehensive base of content knowledge; otherwise, students could receive incorrect knowledge (Koehler and Mishra 2009).	Knowledge about Science or Mathematics subjects. Content in various disciplines differs across school levels. For example, the content in high school science may include knowledge of scientific facts and evidence-based reasoning (Koehler and Mishra 2009).
PCK	According to Shin et al. (2009), 'PCK is knowledge about what teaching approaches fit the content and how elements of the content can be arranged for better teaching' (p.2). In other words, it is the knowledge of how to facilitate the learning of specific content (Koehler and Mishra 2005 2009; Mishra and Koehler 2006). This type of knowledge involves understanding students' prior knowledge. Teachers with PCK understand that different concepts in a subject area require different teaching approaches (Schmidt et al. 2009).	Knowledge of using analogies to teach electricity (see Shulman 1986)

TPK	TPK can be regarded as 'an understanding of how teaching and learning changes when particular technologies are used' (Mishra and Koehler 2008, p.9). This implies knowledge about pedagogical constraints and the potential of technological tools when used in different ways and situations in a specific subject or disciplinary context. Put together and integrated, PCK, TCK and TPK constitute TPACK (Koehler and Mishra 2009). However, teachers need to be flexible, creative, and open-minded in seeking technology to improve their students' learning and understanding. This is because most popular emerging technologies are not developed for educational purposes. Teachers need to have TPK that allows them to re-purpose technologies for specific pedagogical applications (Koehler and Mishra 2008).	It may be knowledge about use of geospatial technologies such as 'Google Earth' to address real-world geography problems (Doering, Scharber, Miller and Veletsianos 2009).
TCK	Knowledge about how to use technology to represent/research and create the content in different ways without considerations about teaching	Knowledge about online dictionary, SPSS as cognitive tools, subject specific ICT tools e.g. Geometer's Sketchpad, topic specific simulation
TPACK	Knowledge of using various technologies to teach and/ represent and/ facilitate knowledge creation of specific subject content. Teachers must have a spontaneous understanding of the complex interaction between the three basic components of knowledge	Knowledge about how to use Wiki as a communication tool to enhance collaborative learning in social science

	(CK,PK,TK) by teaching content using appropriate pedagogical systems and technologies.	

Table 2.3. *Definitions and examples of TPACK (Koehler and Mishra 2008; Koehler and Mishra 2009)*

2.6 Conceptual framework of the current study

A conceptual framework is a researcher's map of the territory being investigated, encompassing the broad ideas and principles from a field of inquiry that structure and scaffold the study and thereby assist the researcher to draw meaning from findings (Smyth 2004). It also attempts to connect to all aspects of the inquiry (e.g., problem definition, purpose, literature review, methodology, data collection and analysis) (Miles, Huberman and Saldaña 2014; Miles and Huberman 1994; Robson 2002). Miles and Huberman (1994) define a conceptual framework as a visual or written product, one that 'explains, either graphically or in narrative form, the main things to be studied---the key factors, concepts, or variables—and the presumed relationships among them' (p. 18).

The TPACK framework was employed as an analytical tool to examine why and how preschool teachers use ICT effectively in classrooms. There are three main factors identified from the literature guiding the design of this study (see Figure 2.3). The conditions of school ICT environment, professional support by government, policy and support, personal skills, and personal factors are also important factors that may have relationships to the effective use of ICT. Thus, I am interested in exploring the impact that these factors have on teachers using ICT in curricula.

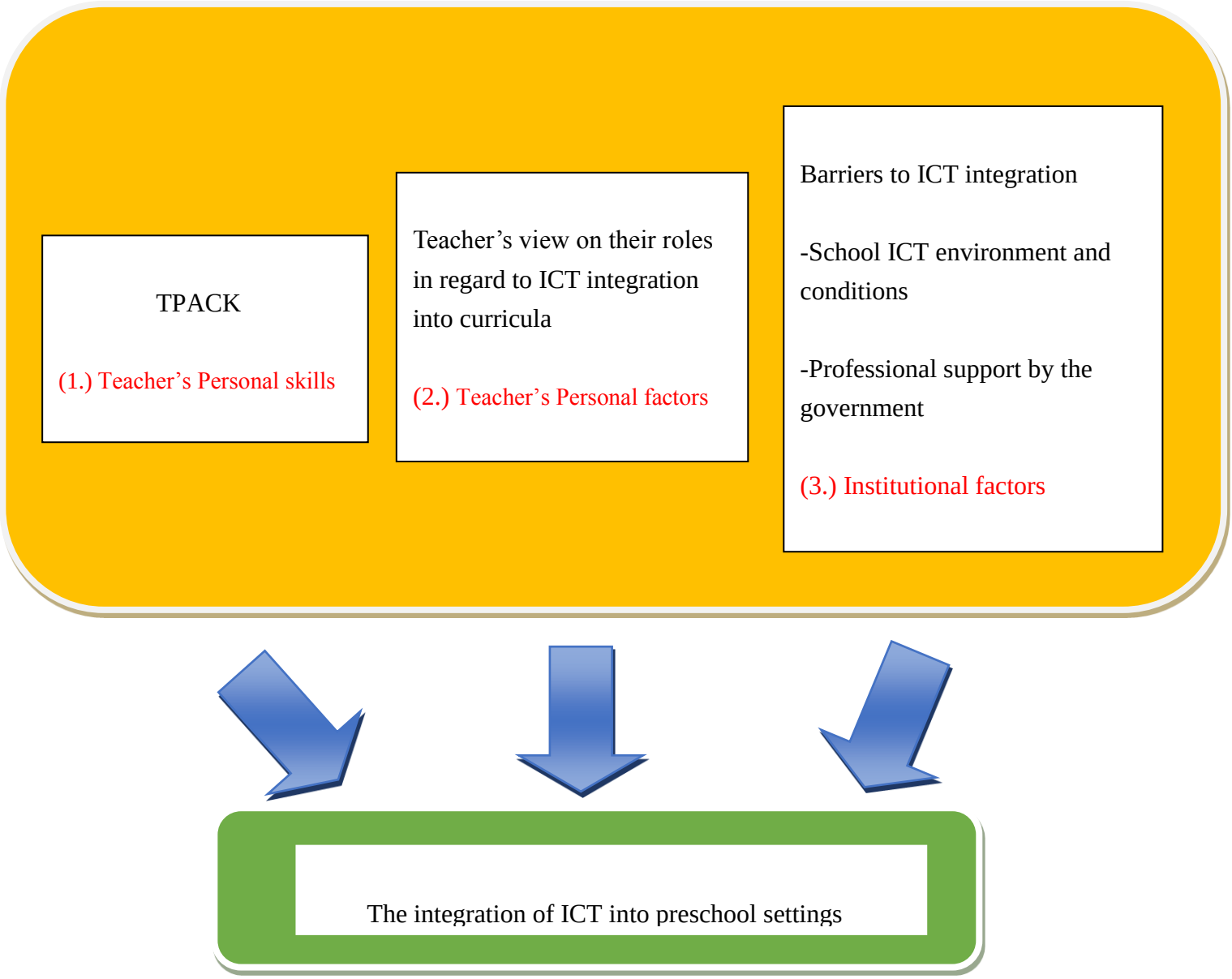

Figure 2.3. The conceptual framework of the current study for analyzing ICT integration in preschool classrooms

2.7 Summary

In this chapter, a discussion of the literature that is relevant to this study has been presented. It provided a discussion relative to the arguments on the advantages and disadvantages of using ICT in early childhood education. The literature indicates that it

would be more meaningful if preschool teachers were provided some theoretical background of integrating ICT into the preschool settings. Some of the challenges that teachers may encounter using ICT in teaching are also discussed. Under such circumstances, through the review of literature and the conceptual framework, appropriate use, supported by all forms of TPACK knowledge, in order for young children to reap the pedagogical benefits of technology seems to be a better choice than avoiding using technology in the field of early childhood education. Specifically, the present study was designed to seek to answer the following research questions:

Research question 1: What are teachers' perspectives on integrating ICT into Hong Kong preschool teaching and learning?

Research question 2: How do Hong Kong preschool teachers describe and understand their roles of ICT in the teaching and learning process for young children?

Research 3: What are teachers' perspectives on the institutional barriers influencing the implementation of ICT in preschools?

In Chapter 3, the methodology and methods employed for this study will be presented in detail.

CHAPTER 3 RESEARCH METHODOLOGY

A qualitative case study research design was used to examine the integration of ICT in two preschool settings. The purpose of this chapter is to explain how the data collection procedures in the research were developed, justify each of the methods in the process, as well as describe the sampling and the selection of schools, the lessons included in the dataset and the data analysis used in the study.

3.1 Strategies for qualitative research

I considered the methodological research paradigms in terms of my research needs and values, deciding that a qualitative approach was the most appropriate for my study. As my data collection and interpretation relies on the analysis of teachers' responses to particular questions, my epistemological approach would be described as interpretive.

(i) *Epistemological lens and an interpretive research approach*

Epistemology is supposed to answer the following questions: How do we know what we think we know? How can we differentiate between truth and falsehood? According to Deniz (2014), each of us views the world through an epistemological lens. The term, epistemology, refers to the specific beliefs that people hold about the nature of knowledge (Schraw and Olafson 2002). Epistemology assumes that knowledge is produced through the social and cultural acts of dialogues and interactions. There are a number of epistemological positions which researchers can take, with the two main theoretical paradigms which is positivist/post-positivist and interpretive/constructivist. The purpose and subsequent research questions generated by interpretivist researchers are more often explored through qualitative research. According to Orlikowski and Baroudi (1991), interpretive studies assume that people create and associate their own subjective

and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through assessing the meanings participants assign to them. Interpretivists are concerned with meaning and understanding persons as actors in society in which they interpret meanings and actions in line with their own personal viewpoints (Hesse-Biber and Leavy 2011). Consequently, this study employed the interpretivist tradition, resting on the researcher's ability and position to interpret the social world using case studies to examine the integration of ICT by preschool teachers in Hong Kong preschool settings. In the context of this study, preschool teachers have their own views on using ICT in teaching which is influenced by the society and culture of Hong Kong (i.e., government policies, academic orientation culture and trends of educational ICT implementation).

(ii) ***Positionality of the researcher***

I selected an interpretive approach for this research study; thus my positionality may affect how the interpretation of the meanings of the participants. Positionality may include aspects of identity (like gender, class, sexuality and so on) as well as personal experience of the researcher (such as research training and previous projects worked on) that may influence the interactions between the researcher and the researched (Hopkins 2007). Thus, it is the 'lens' through which to view the interactions between researchers and the researched (Calabrese 1998). Understanding positionality is crucial to effective data collection and analysis because various identities of researchers may influence and shape encounters, processes and outcomes of the studies (Valentine 2002; Vanderbeck 2005).

I have been devoted to pre-primary education since 1996 and became a kindergarten teacher after two years of kindergarten teacher training in 1999. I have also taken on the role of IT teacher to assist in organizing some IT teacher training activities and joined in the

Quality Education Fund project relating to IT implementation in the preschool environment. After completing an Advanced Postgraduate diploma in IT Education, I joined a kindergarten teacher training programme in the Department of Early Childhood Education in The Hong Kong Institute of Education and conducted the IT in the Preschool module, which is related to my research topic. Also, I have many years of experience in pre-service and in-service preschool teachers' teaching supervision, and have a full understanding of the teaching conditions in pre-primary institutions as a whole. These experiences have provided me with opportunities to understand more about the ICT integration of Hong Kong preschools. During my time as a doctoral student, I applied and participated in several internal research projects on ICT with young children. Hence, it is possible that my position could have affected the interpretation during the analyzing process.

(iii) Qualitative approach decision

From the point of view of educational researchers (see for example, Morse 2003; Miles and Huberman 1994), both traditions of qualitative and quantitative research are valuable since they complement each other. The different approaches can provide different perspectives to an issue, leading to the generation of different types of data that can contribute to a better understanding of the issues under study. Quantitative research implies asking questions about phenomena whose answers are quantifiable within the framework of rationalistic and logical positivism (Singh 2007). Quantitative data 'are used to describe current conditions, investigate relationships, and study cause-effect phenomena' (Gay and Airasian 2000, p. 11). The positivist approach emphasizes deduction and is strongly based on a highly structured hypothesis testing process commonly employed in the natural sciences, which usually generates quantitative data (Singh 2007). On the other hand, qualitative research emphasizes induction and generally aims to show the meaning or

significance of processes applied to particular people or groups of people, asking them to explain their attitude towards a particular issue but not making generalizations (Strauss 1995; Gerring 2007; Murakami 2013). At times, this study was both inductive and descriptive. The study aimed to describe the phenomena under investigation thoroughly, and it was inductive because it aimed to engage in concept development rather than testing established theory.

Additionally, according to Punch (2005), research questions concerning the effects of factors or variables, as well as correlations among them, require a quantitative method to answer them, while questions aimed at discovering, seeking to understand or explore a process, or describing experiences which might imply a qualitative research method. Thus, in this research, the research question sought to understand how ICT is implemented and integrated in the preschool settings in Hong Kong. These types of 'why' and 'how' questions are suited to qualitative research designs (Creswell 2003, 2007; Maxwell 2005). The rich description of a social phenomenon (i.e., using ICT in education) will be expressed by the words and meanings constructed by preschool teachers, complex phenomena that cannot be analyzed simply by using numbers or statistics. Because this study investigates the why and how of decision-making, not just what, where and when, it is thus suited to a qualitative research design (Creswell 2003, 2007; Maxwell 2005). Qualitative methods also focus primarily on the kind of evidence (what people tell, what they do) that will make evident the meanings people give to their experiences.

In this study, there were two phases in the exploration of two cases. The case study method was chosen for data collection. For phase one, the focus group design was adopted, and observations and semi-structured interviews were adopted in phase two. A summary of the research tools is shown in Table 3.1.

Research questions	Multiple Data Sources
What are teachers' perspectives on integrating ICT into Hong Kong preschool teaching and learning?	Focus group
	• Teaching observation • Semi- structured interview for each K2 and K3 kindergarten teacher
How do Hong Kong preschool teachers describe and understand their roles of ICT in the teaching and learning process for young children?	Focus group
	• Teaching observation • Semi-structured interview for each K2 and K3 kindergarten teacher
What are teachers' perspectives on the institutional barriers influencing the implementation of ICT in preschools?	Focus group
	• Teaching observation • Semi-structured interview for each K2 and K3 kindergarten teacher

Table 3.1: *Overall research design*

(iv.) ***Strategies of qualitative research: Case study design***

Having decided on a qualitative approach to my study, I considered different methods of inquiry. Anderson (1998) suggests a number of methods which fall under the heading of qualitative approaches commonly used in educational research. One of those

methods is case study. A case study approach has been defined by numerous scholars (Gerring 2004; Merriam 2009; Stake 1995; Yin 2003). Case study researchers are not interested in assumptions and testing; rather, they are concerned about understanding, extracting and interpreting phenomena (Merriam 2009). A case study is a problem to be studied that reveals an in-depth understanding of a 'case' or bounded system, involving understanding an event, activity, process or one or more individuals (Creswell 2003, p. 61). Yin (2003) also indicates that a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (p. 13). It is a naturalistic design with an emphasis on observing, describing, interpreting and exploring events in the complex real-world setting of the classroom (Punch 2005). One of its main features is to allow the researcher to catch the complexity and situatedness of behavior and examine a specific phenomenon. Thus, this study focused on preschool teachers' existing ICT use within their real-life context, as well as their thoughts and experiences regarding the integration of ICT in preschool practices.

Furthermore, Neuman (2006) claims that 'purposive sampling is appropriate to select unique cases that are especially informative' (p. 222), and the in-depth understanding generated by the case study enables the researcher to provide a 'thick description' (Neuman 2006) of the research topic through which to discover the important features of complex socio-cultural phenomena. Adopting case study as a research strategy has such advantages of helping me to understand more about how ICT is integrated into the preschool curriculum. This is something key to my research because it explores ICT usage of participants in their classroom.

Moreover, Yin (2009) identifies that 'case studies are the preferred method (a) when, how or why questions are being posed, (b) the investigator has little control over the events and (c) the focus is on a contemporary phenomenon within a real-life context' (p. 9). For this study, the most important questions were to examine in detail teachers' views on how they integrate ICT in teaching; hence, participants were selected according to the needs of the study (Morse 2003). The case study was used as a method to provide insight into the complexities involved in teachers' use of ICT in different settings (Leung 2010; Plowman and Stephen 2005; Starkey 2010).

Furthermore, Gerring (2007) lists documentation, archival records, interviews, direct observations, participant observations and physical artefact as six sources of evidence for case studies. No one source is better than others, but using many sources strengthens case studies (Yin 2009). Thus, multiple sources of data collection methods were used in this research (Yin 2009): semi-structured interviews, field notes and classroom observations.

3.2 Research design

(i) Rationale for the selection and sampling of participants

1. The Schools

Since the objective of my study was to understand teachers' views on their usage of ICT in schools in depth, it was therefore necessary to select 'typical' samples to provide the best information addressing the research questions. In the study, two non-profit-making kindergartens were chosen. One is located in Kowloon; the other kindergarten is located on Hong Kong Island. Purposive sampling (Patton 2002) was employed in this study, requiring access to key informants in the field who can help in identifying information-rich cases (Orlikowski and Baroudi 1991). In addition, it is a technique used by researchers to select sites and/or participants intentionally, with some criteria and attributes in mind that address

the research questions (Merriam 2009).

However, it was difficult to find participants in the beginning, even though I am an early childhood trainer with connections to different schools. From October to November 2014, I spent a lot of time contacting and inviting ten schools to participate. They agreed to do so when they heard I was doing interviews but immediately decided not to participate when I said observation would be adopted. Only two schools agreed to the classroom observations, so I decided to choose these two schools from a large number of schools. I then made phone calls to principals to explain my research purposes and procedures, and to request their participation. Following Patton (2002), criterion sampling was used in the study. Criterion sampling involves reviewing and studying 'all cases that meet some predetermined criterion of importance' (Patton 2002, p. 238). In this study, I contacted ten kindergartens that fulfilled the following three criteria, which I specified and defined reasonably: (a) participating in the Pre-primary Education Voucher Scheme,[5] (b) a local non-profit kindergarten, and (c) Quality Assurance inspection by the Hong Kong Education Bureau. Although only two kindergartens agreed to join this study, 77.7% of kindergartens in Hong Kong fulfil these criteria (Hong Kong Census and Statistics Department 2013). Therefore, the two kindergartens in my study could be described as typical case studies (Gerring 2007) that represented the majority of kindergartens in Hong Kong.

Furthermore, this study investigated two parallel cases. The design of this study

[5] A Pre-primary Education Voucher is a certificate given by the Hong Kong government to enable parents to pay their children's education at a pre-primary school of their choice rather than at an assigned public school (Li et al. 2008). Also, such education voucher is effectively a subsidy for parents for their very young children aged 3 to 6.

involved collecting data from all the preschool teachers of K2 (ages 4-5) and K3 (ages 5-6) in the two schools. However, with a view to highlighting and comparing the differences between the levels of using ICT in teaching, one more criterion was added for inclusion in one of the kindergartens: this school has emphasized ICT education in young children's learning in its school policy. Through contact and visits to numerous kindergartens, some kindergartens are well-known for integrating computer technology in their classroom teaching in Hong Kong. I selected research participants who were willing and appropriate for this study. From October to November 2014, contact was made through a personal connection between me and school principals, who agreed to participate in this research study. Table 3.2 is the summary or the background information of both cases in this research.

Kindergarten	**Location**	**District**	
A	Hong Kong Island	Aberdeen	Nonprofit, ICT guidance
B	Kowloon	Wong Tai Sin	Nonprofit, no ICT guidance

Table 3.2 *Basic information of the kindergartens visited in the study*

2. Participants and setting for the focus group

The focus group participants were frequently selected using purposive sampling (Vaughn et al. 1996; Morgan 1997); I selected participants based on their knowledge of and expertise in the subject under investigation (Polit and Tatano Beck 2006). Moreover, the existing literature suggests that the number of people in a group can range from four to 12. For example, Cameron (2005) suggests between six and ten, Subramony et al. (2002)

suggest six to twelve, Hennink, Hutter and Biley (2011) suggest between six to eight. Therefore, six to eight preschool teachers who are K2 and K3 class teachers in the kindergarten were invited. The participants were invited either via telephone invitations or postal mail invitations. The study's aims and significance, research procedures, duration, method and process of data collection were explained in the invitation. After they agreed to participate in the study, participants were sent consent forms through fax and received one week later. The identities of the interviewees were protected. Practitioners were provided with a common definition of ICT to increase consistency in their responses. Table 3.3 shows the allocation of these participants. The names of the interviewees are pseudonyms.

Kindergarten	**A**	**B**
	Mr. Ku (K3) **(IT teacher)**	Teacher Lui (K2)
	Teacher Lau (K3)	Teacher Leung (K3)
	Teacher Yip (K3)	Teacher Yip (K3)
	Teacher Lai (K2)	Teacher Ching (K2)
	Teacher Sun (K3)	Teacher Hui (K3)
	Teacher Or (K2)	Teacher Chau (K2)
	Teacher Kwok (K2)	Teacher Ng (K2)
	Teacher Wong (K2)	
	Teacher Au Yeung (K2)	

Table 3.3 *Information of the focus group teachers*

3. The observed teachers

Four teachers shown in Table 3.4 – two teachers from each of the two studied preschools – were observed. The four teachers selected for this study were chosen using purposive sampling since this method enables the researcher to learn the most and gain a

deeper understanding of a phenomenon (Merriam 2009). The selection of the interviewees and the observation classes were based on recommendations by the school principals, who were familiar with their own situation in ICT integration. To ensure the anonymity of the participants, preschool teachers' names were replaced with pseudonyms. I also told participants that they had the right to withdraw at any time if they desired. I stressed that the purpose of this study was not to judge the participants' teaching performance or ability and that I would not discuss their teaching with their principals.

Kindergarten	**Observed Teachers**	**Class**	**Age of Students**
A	Teacher K	K2	4-5
A	Teacher L	K3	5-6
B	Teacher C	K2	4-5
B	Teacher Y	K3	5-6

Table 3.4 *Information of the classroom observed teachers*

(ii) Data collection

1. Introduction

Having decided on a qualitative approach to my research, I then considered different methods of inquiry. The data collection methods used for this study are listed in Figure 3.1 and Table 3.5. Three data collection methods for interpretive research were used: focus group, observation and semi-structured interviews.

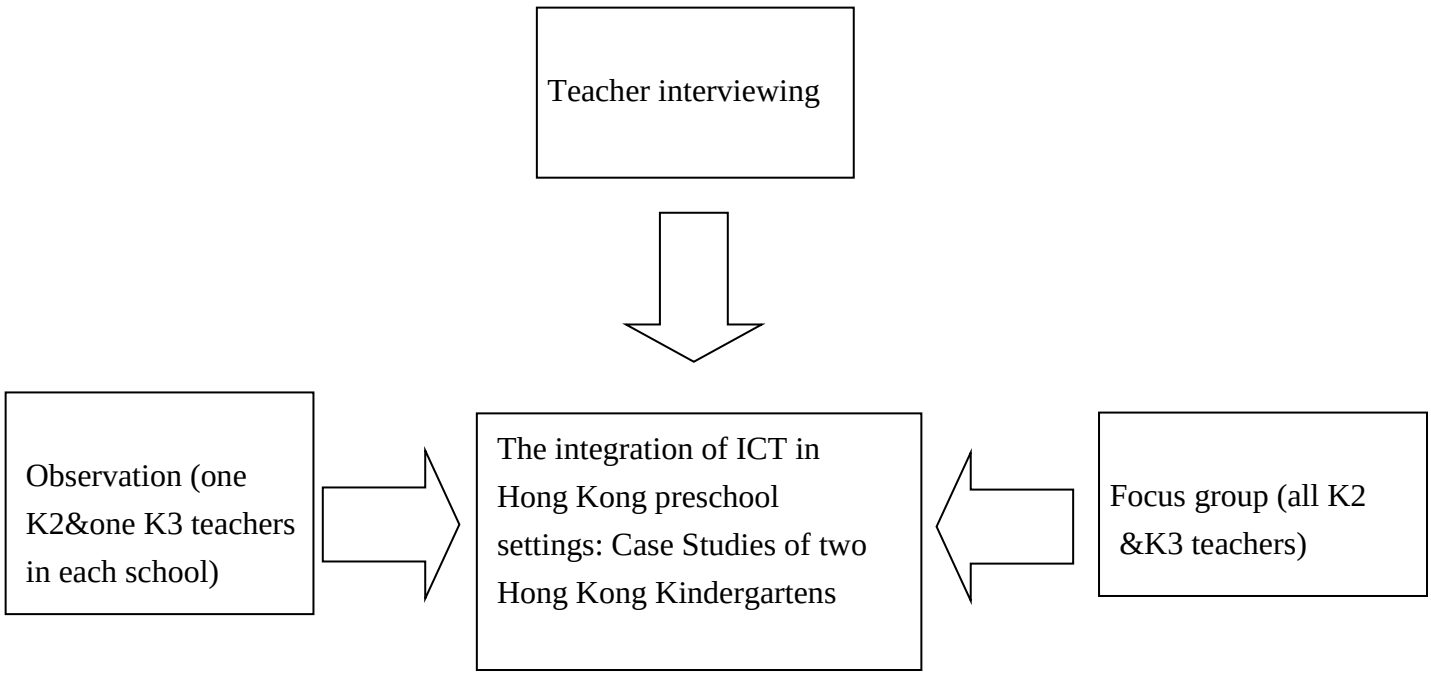

Figure 3.1 *Design of the data collection methods*

Stages	**Timetable of research**	**Data collection**
Stage one	Focus group for all the K2 and K3 teachers from the two case schools (Oct to Dec 2015)	Collected the information about research Q1, Q2 and Q3.
Stage two	Classroom observation and post-observation semi-structured interviews (June 2015)	Collected the information about research Q1 and Q3.

Table 3.5 *Data collection during the two stages in this study*

The mother tongue of Hong Kong people is Cantonese, so all the interactions, including focus group and semi-structured interviews, were conducted in Cantonese. I translated these into English and sent the translations to colleagues who are English teachers and the four interviewees to check them for accuracy.

2. Rationale for the focus group

Focus groups are one way to create a synergy which motivates and stimulates in-depth discussion. Like other qualitative methods, focus groups allow the researcher to gather in-depth information from a small group of participants within a limited period of time (Flick 1998; Hennink 2014). Engaging in discussion potentially enables the participants to challenge, question and redefine one another's perspectives (Bryman 2008; Hennink 2014). Besides, unlike one-to-one interviews, focus groups can be used to expose the differences, contradictions, unique experiences, views, perceptions and attitudes by different members (Bennett 2002), allowing for a richer understanding of the issues. However, they may not necessarily reflect individual views (Thackeray and Neiger 2004) because some people do not like to express their views in a group. In this study, a focus group of experienced preschool teachers from two typical schools provided invaluable information about the attitudes and perspectives of teachers' ICT integration in preschool settings.

The aim of the focus group was to explore the attitudes that the teachers encountered towards ICT integration into the curriculum of Hong Kong preschools. The personal information of the participants was kept anonymous and confidential. Only the researcher knew their names and had access to their information (see section 5 for further information of ethics). In my study, the focus groups lasted for 40-45 minutes, and their durations usually were related to whether the topic was specific or broad and the number of questions that were asked (Plummer-D'Anato 2008). The eight interview questions are in Appendix B. Table 3.6 shows the details of the focus group in these two participant schools.

School	Number of participants	Date	Duration
A	nine	28/11/2014	65 minutes
B	seven	12/12/2014	60 minutes

Table 3.6 *The details of the focus group in the participant schools*

3. Rationale for videotaped classroom observations

Observation is largely concerned with the illustration and description of data, and it plays an important role in all qualitative research (Marshall and Rossman 2011). Observations provide a mechanism to conduct research in a realistic environment that can reveal more about the research questions than guided interviews (Marshall and Rossman 2011). Information such as body language, delivery methods, and environmental details are able to be observed, which add to the formal data of the interview process (Marshall and Rossman 2011). In other words, the relation between teachers' words and practices were presented clearly in the observation. The aim of my research was to investigate the role of ICT for preschool teachers in regard to using technology for teaching and learning. Therefore, I found that the best approach is to be 'an observer', but not participate in the classroom, which allowed me to view the situation firsthand and record my observations. As advised by Yin (2009), I used direct observation and sat quietly in the corner of the classroom, making field notes and recording interactions between the teacher and the students – specifically, what the teacher said and how the students responded, without any intrusion in the teaching and learning in the classrooms. The non-intervention principle and naturalistic observation was employed during lesson observations to ensure the neutral status of the researcher. It was non-participant observation, in that the researcher interfered

as little with teachers to avoid affecting their behaviour (Robson 2002). Nevertheless, it is not possible to get rid of the 'observer effect' as 'participants may alter their behaviors as a result of being observed' (Casey 2006, p. 77). In this study, I arranged a focus group before starting the observations for 45 to 60 minutes to enable the participants to become familiar with my presence (Casey 2006).

4. Participants and setting for classroom observations

For the observation part in this study, two teachers from K2 and K3 in both schools were selected respectively by the researcher. These four teachers would be observed twice in their classroom as they integrated technology with students during the month of June 2015. During the 30-minute observation, observation notes were taken. Participants were told they would be observed as to how they integrated ICT into their teaching. Therefore, they planned for me to observe two activities for which they were planning to integrate ICT in two weeks. Table 3.7 provides details of when the observations took place.

Date (2015)	**Kindergarten**	**Name of participant**	**Class**	**Data Collection Method**	**Duration**	**Total time**
2/6, 3/6	A	Miss Y	Upper Class	Observation guide and video	2/6 (34 minutes) 3/6 (28 minutes)	62 minutes
2/6, 3/6	A	Miss C	Lower Class	Observation guide and video	2/6 (40 minutes) 3/6 (31 minutes)	71 minutes
17/6, 19/6	B	Miss L	Upper Class	Observation guide and video	17/6 (31 minutes) 19/6 (27 minutes)	58 minutes
17/6, 19/6	B	Miss K	Lower Class	Observation guide and video	17/6 (34 minutes) 19/6 (28 minutes)	56 minutes

Table 7 *Observation details*

However, I did not enquire about how much they use ICT in the activities so as not to influence the teachers and thus to ensure that the data would be naturalistic. Moreover, I explained to the principals and teachers the purpose of this observation so that the observed teachers would not be forced into using ICT in the teaching unit just for the sake of the research. Therefore, I would be able to observe two activities across two to three weeks in the same teaching theme on the same learning unit in a naturalistic environment.

In addition, the Technology Integration Observation Instrument (TIOI) (see Appendix C) was developed in accordance with the framework of TPACK to aid in determining the level of technology integration. Moreover, all the observations were videotaped because the purpose of viewing classroom videos is to capture what actually happens in the classrooms while ICT in teaching and learning is being implemented, and to provide additional information that may not be easily identified through the interview data

(Creswell 2007).

5. Rationale for semi-structured interviews

Semi-structured interviews were selected for this study. A semi-structured interview allowed for a freer exchange between me and the interviewees, permitting more room for variation in responses than structured interviews (Kvale 1996). In order to allow for sufficient depth in the interviews, a semi-structured interview is literally an '*interview*, an interchange of views between two persons conversing about a common theme of mutual interest' (Kvale 1996, p. 14). Instead of strictly following the interview guide, the researchers are able to raise other relevant questions based upon the given responses. Thus in this research study, the post-lesson interviews followed a semi-structured format, allowing for more flexibility and freedom to ask broader questions beyond the standardized ones in a predetermined order. I did not interrupt the teachers when they went beyond the question guide in the interviews to encourage them to provide more information. This gave the teachers more space to elaborate their answers to the questions and to express their feelings in greater detail. I asked the teachers to clarify any unclear points of the observed lessons in the post-lesson interviews. Table 3.8 shows the semi-structured interview details.

School	Name of participant	Class	Interview	Interview Dates (after classroom observation)	Duration
B	Miss Y	Upper Class	1	2/6/2015	23mintues
			2	3/6/2015	22mintues
B	Miss C	Lower Class	1	2/6/2015	20 minutes
			2	3/6/2015	18 minutes
A	Miss K	Upper Class	1	17/6/2015	22 minutes
			2	19/6/2015	24 minutes
A	Miss L	Lower Class	1	17/6/2015	25 minutes
			2	19/6/2015	20 minutes

Table 3.8 *Interview details*

However, managing the dialogue required great skill. A set of interview questions covering the key areas of the study were drawn up beforehand. These questions guided the interview process. In my study, a series of interview questions were written based on the research literature findings and the TPACK framework. This allowed me to investigate and seek answers to answer the research questions (see Appendix D).

Semi-structured interviews provided me with the opportunity to discuss the preschool teachers' thoughts and experiences relating to their use of ICT. The information gained from the interviews was coupled with the information gained from the observations in order to provide a more detailed and relevant answer to the research questions. The semi-structured interviews were conducted in Cantonese, as it is the dialect most widely used in

Hong Kong. This was to make sure that each transcript would reflect the actual meanings by the teachers throughout the interviews.

6. Participants and the setting of the semi-structured interviews

After each classroom observation, a post-observation interview was conducted as a debriefing and provided the teacher time to reflect upon the lesson and technology integration. Most of the interview questions were open-ended with maximum room for participants to expand their views and reactions. The discussion did not only focus on their teaching strategies because it was more sensitive and related to their professional competence. These actions helped to create trust among the participants and me, and encouraged the participants to share their views and practices regarding their teaching.

To aid data analysis, the interviews were recorded using a digital voice recorder and the recorded file transcribed later for reference with the interviewees' consent. Each interview lasted approximately 30 minutes in offices or classrooms for convenience. Interview questions in Appendix B were based on the focus group and literature review. A commitment was made to the interviewees that all the information collected was to be used for this study and the voice recordings and transcripts would be destroyed after the completion of the research. Also, the identity of the interviewees was protected. Practitioners were provided with a common definition of ICT to increase consistency in their responses (O'Leary 2014). In this study, I designed the interview questions to answer the three research questions. The formal, face-to-face, and semi-structured interviews were conducted with each participant in order to gather data from them to understand more about the research questions. Table 3.9 shows the procedures of data collection in the whole study.

Methods	Pre-lesson focus group with all K2 and K3 teachers	Lesson observations	Semi-structured interviews with observed teachers
	Audio recordings; video recordings; transcripts	Video recording, observation guideline; transcripts	Audio recordings; transcripts

Table 3.9 *Procedures of Data Collection in the whole study (4 stages from Oct 2014 to Jun 2015)*

(iii) Data analysis: Thematic analysis

This study employed thematic analysis based on the work of Boyatzis (1998) and Braun and Clarke (2006, 2013). Boyatzis describes it as a way of seeing, and a process for encoding qualitative information through the use of codes and themes (Boyatzis 1998), while Braune and Clarke (2006) perceived it as a method for 'identifying, analyzing and reporting patterns (themes) within data' (p. 79). This method is an analytic approach that leads to organizing and analyzing the data through examining its rich details (Sparkes and Smith 2009; Vaismoradi 2013). In addition, Braun and Clarke (2006) suggest that thematic analysis is straightforward and user friendly for students and novices to use in qualitative methods. It can accommodate rich and comprehensive data, as it is applicable to different theoretical and epistemological approaches. In fact, thematic analysis was chosen because it is a flexible, uncomplicated technique for qualitative research that allowed me to be informed by the use of a theoretical framework and to generate new insights for the study (Braun and Clarke 2006). In this study, the procedure proposed by Braun and Clarke (2006, 2013) in thematic analysis was used because the technique is suitable for the key features

of the data in regard to answering the research questions. Table 3.10 summarizes the steps of analysis used in this study. The preschool teachers' interviews from two schools were first translated from Cantonese into English, transcribed and then coded, based upon themes related to the research questions (Cohen, Manion and Morrison 2000). The focus group discussion, observation and semi-structured interview data were triangulated with the focus group data to enhance the reliability of the research.

Phases	Description of the process
One: familiarizing yourself with your data	Reading and re-reading the focus group, observation and semi-structured interviews to ensure familiarity with the dataset, noting the initial ideas and thoughts.
Two: Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire dataset.
Three: Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
Four: Reviewing themes	Checking themes back against individual transcripts and the entire dataset, creating a thematic 'map' of the analysis.
Five: Defining and naming themes	Scrutinizing previous stages to ensure that the map provided an explanatory framework consistent with the text. Further review, clarification and refinement of the map.
Six: Producing the report	Selecting examples from the data to illustrate themes and respond to research questions, analyzing and interpreting results by referring back to the research questions and the literature.

Table 3.10 Steps *of thematic analysis*

However, there are disadvantages of thematic analysis: 'a lack of transparency' and unclear guidelines imply an 'anything goes critique of qualitative research' as Braun and

Clarke (2006, p. 78) comment. Then the dataset was coded and themes identified by me, i.e. only one person. The process was methodologically consistent but did not provide multiple views from a variety of people with differing expertise. Some literature argues that a more rigorous process involves the coding of data by several people, with themes being developed through discussion with a panel of experts, other researchers or participants themselves (Fereday and Muir-Cochrane 2006). In fact, the initial codes were both inductive and deductive, in that they originated both from my own theoretical understandings and from the respondents themselves (Miles and Huberman 1994). Thus, I do not argue that the codes emerged exclusively from the data, a claim that would have been criticized by many scholars practising thematic analysis (Holter 1996; Guest et al. 2012; Braun and Clarke 2006).

For the analysis of the focus group, observation and semi-structured interviews, I transcribed all the video and audio recordings for further analysis, and then read through them all to get an overview, whereupon I went back to re-read them carefully. I re-read each transcript against the original audiotape. The object of the first step was 'familiarizing [my]self with [my] data' (Braun and Clarke 2006, p. 87). In addition to ensuring that the transcripts represented what was in the tapes, the auditing helped me gain 'close contact and familiarity….with the data' (Boyatzis 1998, p. 45). In this second reading, line-by-line coding was done to describe the main essences. This process meant that any codes that overlapped could be discarded or merged. After 'generating initial codes', I familiarized myself with the data and had some thoughts about coding it. The second step was identifying the interesting elements within the raw data. After the first coding, a list of themes was created and correlated by identifying recurring words and themes that captured participants' perceptions about technology use in preschools. In the third step, regarding 'searching for

themes', I reorganized different codes for possible themes and sub-themes. For example, roles of teacher in ICT, ways of using ICT in the classroom, barriers to ICT usage in preschools, and trend of ICT use in early childhood education; in total six themes were identified (see Appendix E). At the next stage, I identified themes and subthemes, made comparisons between the data, and created a thematic map. For the fifth step, 'defining and naming themes', I revised the thematic map and refined the particulars of different themes and sub-themes. The thematic map can be found in Figure 1 in Appendix E. Finally, an ongoing analysis was conducted to refine the specifics of each theme and to find the overall picture of the analysis (Braun and Clarke 2006).

In stage one, two focus groups from participant schools were conducted and the content was transcribed and thematic analysis employed following the process outlined by Braun and Clarke (2008) as described above. The first thematic map was generated in Figure 3.2 in April 2015. For stage two, the same procedure of thematic analysis was used to analyze the data of observation and interviews to create the new thematic map in Figure 3.3 in August 2015. Then I tried to compose these two thematic maps by sorting the different codes from these two maps into some potential themes and sub-themes to produce a final thematic map in November 2015. The final thematic map of this study is shown in Figure 3.4.

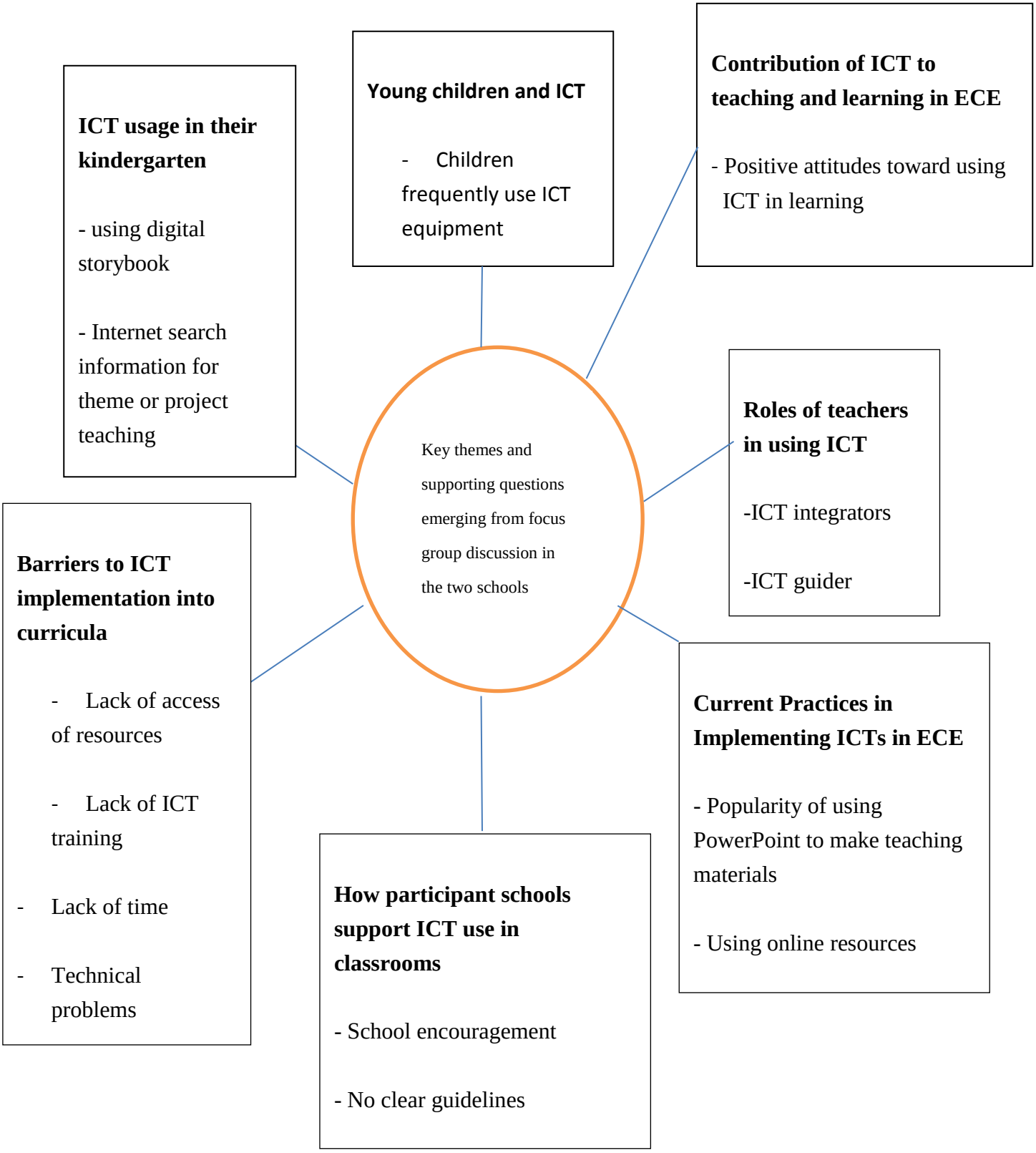

Figure 3.2 *Thematic analysis on focus group (April 2015)*

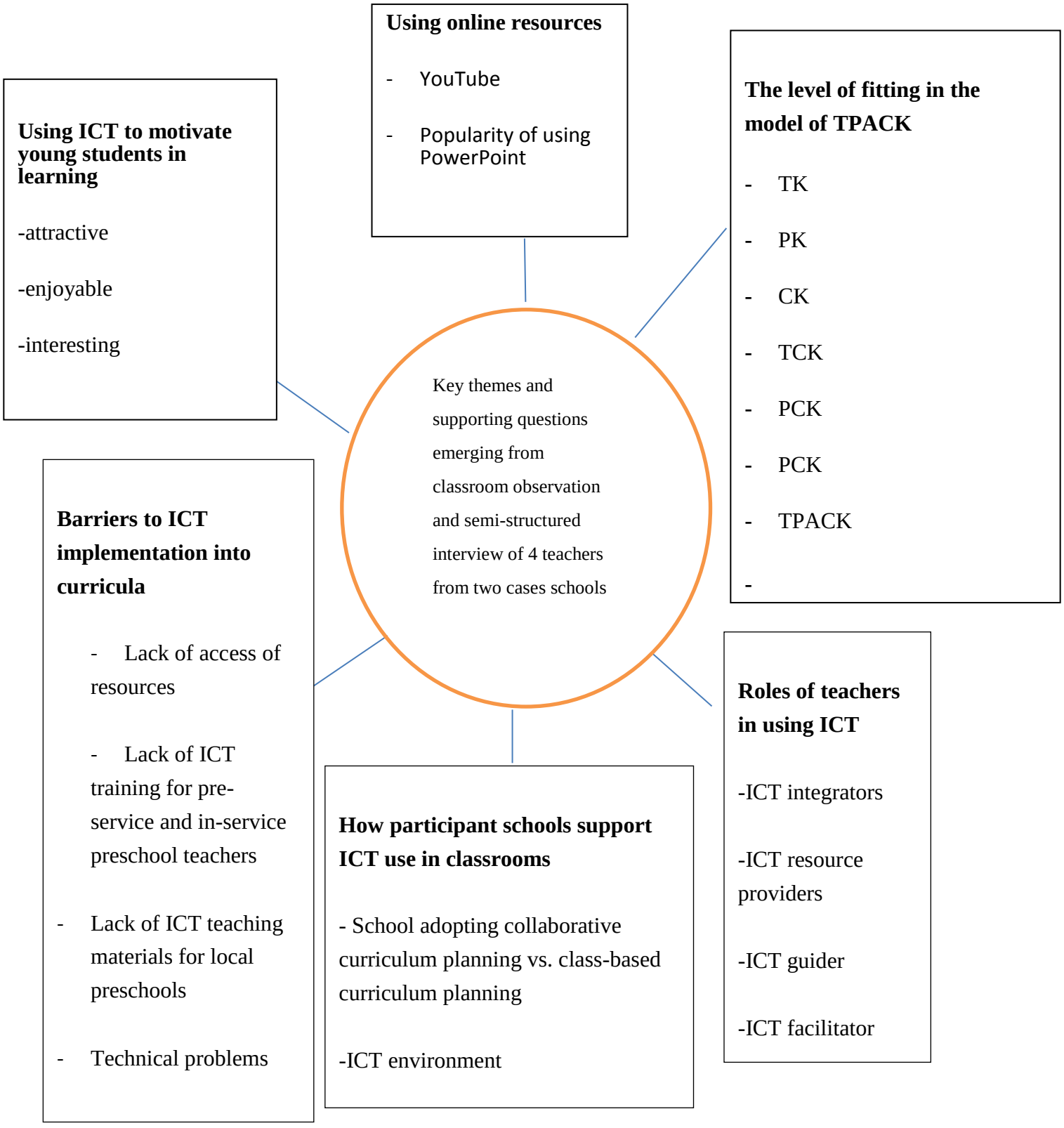

Figure 3.3: *Thematic analysis on observations and interviews (August 2015)*

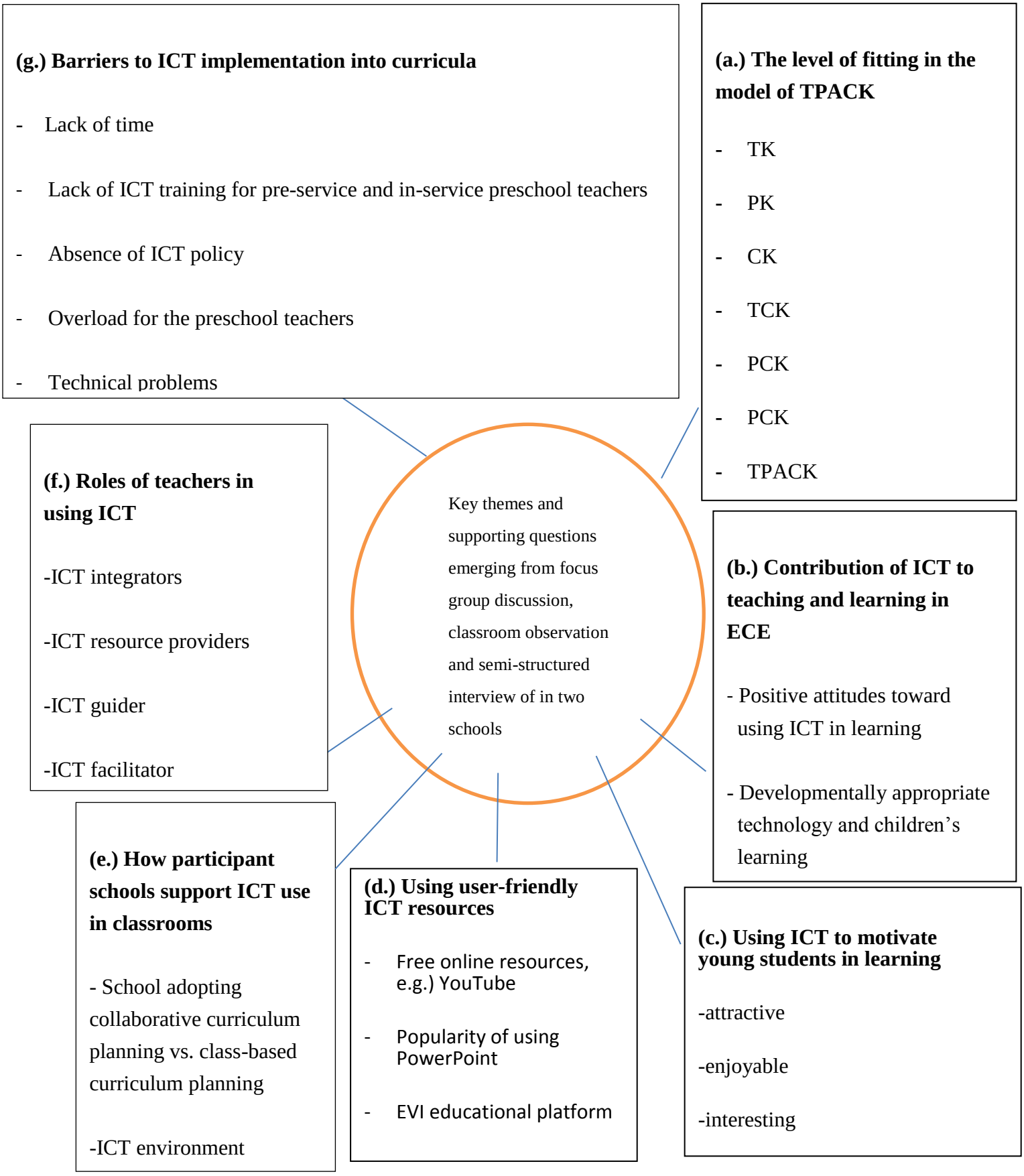

Figure 3.4: *Thematic analysis on focus group, observations and interviews (November 2015)*

Trustworthiness/Validity of the Data

Positivist realism suggests that there is an objective world governed by general laws, which can be evaluated and described. Extreme relativists judge qualitative research as lacking credibility, questioning positivistic validity and reliability. Bearing in mind this critique, I employed the following techniques to increase the reliability and validity of my qualitative research study: 1) I designed my research study to utilize data triangulation; 2) I performed repeated member checks to give to the participants to check the interview transcripts; 3) I completed frequent observations and regular, intensive interviews with the participants.

One of the most common analytical techniques used to enhance the credibility of a qualitative study is triangulation. In terms of trustworthiness, triangulation through accounts of different participant groups was achieved and 'thick description' or exemplification provided. It involves procedures that researchers can use to increase the strength and validity of the data obtained, and to overcome weaknesses or bias arising from the adoption of a single method (Denzin and Lincoln 1994; Keeves and Sowden 1997). Krathwohl (1998) defined data triangulation as 'the use of two or more sources to establish factual accuracy' (p. 275). It involves using more than one source of data to strengthen the interpretation of the findings from a study (Miles and Huberman 1994). In other words, triangulation means the adoption of a multi-method, multisource data collection strategy in a study to complement the analysis and to ensure an accurate interpretation of data across different methods to increase the validity and reliability of the result (Bekhet and Zauszniewski 2012). Data collection in this study emphasized information obtained from three major approaches of qualitative research, namely focus group, classroom observations and semi-structured interviews, to constitute methodological triangulation. For example, semi-

structured interviews and observations were compared to ensure that the participants' real views and authentic behaviour regarding the integration of technology into the classroom curriculum had been appropriately represented.

The data from different sources were continuously cross-checked with each other to strengthen the basis for interpreting the findings, which also served to mitigate the weaknesses and enhance the strengths of each individual method. Furthermore, my personal position and conceptual framework provided a strategic direction for data analysis, while reducing the temptation to analyze data beyond the research questions (Yin 2009). I also used the member-checking method by having the participants review their interview transcripts for accuracy and validity and for any further insights they may have had. When I finished the transcripts, I sent them to both schools for further comments on the accuracy and validity.

3.4 Ethical Issues

Before commencing data collection, I obtained ethics approvals from Nottingham Trent University. I have an obligation to respect the rights, needs, and desires of the participants in the research. To protect the privacy of the cases, pseudonyms, chosen by me, were used in all the reports. Teachers were assured that all the interview taped scripts were kept confidential and were only to be used for research purposes. All participants were teachers, and the research questions of the study were related to their daily teaching. There was no intent to elicit sensitive or personal data. Also, they had the choice to withdraw from the study at any time without comment or penalty.

Additionally, following Miles and Huberman's (1994) suggestion, I made a commitment to the use of the findings in the consent letter, which explained to and was signed by the participants at the beginning of the study (see Appendix A). Participation was

confidential. All data were securely stored on my personal computer with a security username and password, and the data will be destroyed five years from the completion of the study. Moreover, to preserve anonymity, the real names of the visited schools and teachers were not used. The ethical issue was discussed in accordance with BERA's guidance (2011). Due to the confidentiality assurances provided to the participants, actual participants' names were not used in the study. They were referenced as Teacher Y, Teacher L, and Teacher Wong, and so forth, pseudonyms given by me. Each participant was required to sign a form consenting to the study.

3.5 Summary

In this chapter, I have discussed the development of my methodology in terms of my beliefs and values. I have discussed the strengths and weaknesses of different methods of data collection appropriate for my research and the thematic analysis approach for the data analysis. In this analysis, the coding of the material was based on the principles described by Braun and Clarke (2006). Issues of validity and reliability were considered in this research study. Triangulation was achieved through combining three different sources: focus group, observations and intensive interviews. The following chapter will discuss the findings of the research study.

CHAPTER 4 DISCUSSION AND FINDINGS

4.1 Introduction

A case study approach was used to investigate two kindergarten teachers' perspectives on using ICT in their classroom. The research questions were as follows:

- What are teachers' perspectives on integrating ICT into Hong Kong preschool teaching and learning?
- How do Hong Kong preschool teachers' describe and understand their role of ICT in the teaching and learning process for young children?
- What are teachers' perspectives on the institutional barriers that influence the implementation of ICT in preschools?

This chapter reflects the dominant themes derived from the data analysis by thematic analysis. From analysis of data obtained from teaching observations, semi-structured interviews and focus group across these three sources, the dominant themes were (a) the level of fitting in the model of TPACK, (b) contribution of ICT to teaching and learning in ECE, (c) using ICT to motivate young students in learning, (d) using user-friendly resources, (e) how the participant schools support ICT use in classrooms, (f) roles of teachers in regard to ICT use, and (g) barriers to ICT integration. This chapter presents key ideas from the dominant themes identified from the data analysis (see Figure 3).

4.2 Themes and Context

(a) The level of fit with the TPACK model

In this section an overview is presented of each case's observation and the interviews were analyzed according to the Technology Integration Observation Instrument (for details see Appendix C). I observed four teachers for 25-30 minutes, focusing on the ways in which they integrated ICT in their instruction and showed their TPACK. In the observations, I found that all the teachers were willing to take chances and decide on the

technologies that enhanced their lessons. They integrated ICT into their teaching, which matched the conceptual framework of TPACK (Koehler and Mishra 2008, 2009).

The background of these participants (see Table 4.1) shows that they had all finished or were studying an ECE degree programme with relevant professional in-service training. The content they deal with is relatively simple and general because their students are under 7 years old. In the interviews, most teachers indicated that they were satisfied with the level of integration of ICT in the observed lesson; exceptions were the first lesson of teacher C and the second lesson of teacher Y. Their views were similar to my views. Even though their lesson focused on achieving the teaching objectives, to some extent, their technology was not in harmony with the pedagogy and content. For example, on 17 June 2015, teacher C only used a video sourced from YouTube in an activity explaining the water process to the students. She asked the students some questions related to the video, such as 'When will a rainy day be?', 'Where does rain come from?', 'How does it get into the clouds?' and so forth. Thus, no more interaction was encouraged between the students and technology or students and students. She primarily used visual and auditory means to deliver instruction. The TPACK model, on the other hand, emphasizes the interdisciplinary interaction of three different disciplines for effective technology integration (Koehler and Mishra 2009). In other words, TPACK refers to the teacher's knowledge of effective and efficient use of technology to increase the effectiveness and quality of instruction in the whole teaching process, from planning to evaluation, in the process of teaching specific content (Kabakci and Colclar 2014). Thus, it can be said that, her pedagogy was not in harmony with the content and technology.

	Class and Kindergarten	Experiences in ECE	Working in the current school	ECE training
Teacher C	K2 in Kindergarten B	Almost 1 year	Almost 1 year	Higher Diploma in ECE (Pre-service teacher training) Bachelor of ECE (studying)
Teacher Y	K3 in Kindergarten B	12 years	6 years	Higher Diploma in ECE (in-service teacher training) Bachelor of ECE (in-service teacher training)
Teacher K	K2 in Kindergarten A	3 years	3 years	Higher Diploma in ECE (Pre-service teacher training) Bachelor of ECE (studying)
Teacher L	K3 in Kindergarten A	Over 20 years	15 years	Higher Diploma in ECE (in-service teacher training)

Table 4.1 *Background of the observed participants*

Teacher Y mainly used a music video to stimulate students to revise skills of music appreciation. However, the video was disconnected because of Wi-Fi problems, so she needed to change the original plan to use another song. In Sicilia's study (2005), technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers and teachers having to work on old computers. Sicilia stated 'Technical barriers impede the smooth delivery of the lesson or the natural flow of the

classroom activity' (p. 43). Teacher Y's integration of the technology was not smooth, and she seemed to find it difficult to integrate the three areas.

However, teachers K and L showed a more mature pedagogic practice and more mature practices in developing technology-based lessons. They enhanced the importance of integration of ICT in appropriate ways instead of just using technology for technology's sake. That is, they showed the connection between the first and the second observed lesson; teachers in Kindergarten B could not do that. For example, the lesson objectives of teacher K in Kindergarten A for the two observed lesson were the same: 'To inspire/enhance children's imagination through ICT', showing the linkage between two days' curricula. Besides, there was a strong coherence between the two observed lessons of teacher L, which gave opportunities for students to design e-posters in groups.

During the lesson, the digital technologies teacher K used were a projector, camera, laptop, mirror ball light, CD player, CD and video from YouTube. The teacher's use of technology was very effective. Her integration of the technology was very smooth and in good harmony with her general teaching. On 2 June, she read a Chinese story, '好餓好餓的小白熊' ('A very hungry little white bear'), to stimulate the interest of students in the shape of clouds. Then she used the enlargement function of the projector to amplify the cloud pictures for her students to observe and asked students to say what they felt about the shape of the clouds. After that, she allowed students to use movement to express their imagination, using a digital camera to take pictures and create records to share with the other classmates. Teacher K was a good example of fit among content, pedagogy and technology. These three components supported each other throughout the lesson. Her teaching easily reached the objectives of the curriculum. In the second observed lesson, teacher K also used the same story to elicit the students' previous knowledge. Then she encouraged students to

draw a cloud on the projector film and used the overhead projector to magnify and display the drawings for their classmates to admire. Overhead projectors were used as a tool for discovering and creating patterns and shapes. The drawn films were moved around into different positions as the children explored colour, shape, form and space. These two days' activities were connected by the same story and content. This pedagogy facilitated the students' creativity. Thus, the three aspects of her curriculum were in harmony, supported each other, and resulted in a complete and effective lesson.

Additionally, teacher L in Kindergarten A used strategies combining content, technologies and teaching approaches in her teaching. In the first observed lesson, she used the projector system to enlarge mosquito and cockroach pictures for the students for observation and some government promotion clips were searched online to stimulate students to recognize common pests in summer. Then she encouraged students to design a poster promoting how to prevent pests from spreading to the whole school. Connecting to the content of the first lesson, teacher L asked students to create their own e-poster. She used a computer and a microphone as technological devices. Then she used the function of PowerPoint to teach students how to insert their poster designs and sound to create an e-poster. There was more interaction between students and students, students and teacher, and students and ICT equipment in the whole lesson because it was a new experience for students to record sound on the computer. Recording the students motivated them and increased their participation. Thus, the technologies she chose were appropriate for the content and pedagogy for her lesson.

Observations demonstrated that teachers were willing to explore new opportunities for their students. However, compared with these two schools, teachers in Kindergarten B did not use ICT frequently and as effectively to assist in their teaching. According to the

framework of TPACK (Koehler and Mishra 2008, 2009), in general, they always simply use a television connected the classroom computer to show online materials. As the interview of teacher Y revealed, 'teachers in our school prefer software from a publisher. If we cannot find suitable e-materials from that software, then we prefer to avoid using ICT in that lesson'. In Kindergarten A, teachers provided more and different ICT integration activities for their students. Moreover, teachers from Kindergarten A had access to and used a wider range of equipment (see Table 4.2), thus creating more opportunities for students to have an ICT-enhanced learning experience.

Teacher	**Kindergarten**	**Observed lesson one**	**Observed lesson two**
Teacher C	B	Television, laptop PC, video from YouTube	Television, laptop PC, e-story made by PowerPoint
Teacher Y	B	Television, laptop PC, software from publisher	Television, laptop PC, video from YouTube
Teacher K	A	Projector, Projector screen, CD player and CD, camera, laser pointer, mirror ball light and pictures from YouTube	Overhead projector, overhead project film, white curtain and laser pointer

Teacher L	A	Computer, projector, projector screen, laser pointer, online video clippings	Projector, projector screen, computer, PowerPoint (e-poster), laser pointer and microphone

Table 4.2 *Participants' use of ICT equipment in the observed lessons*

The TPACK model gives preschool teachers a framework for thinking about how the three different professional knowledge domains – namely technological knowledge, pedagogical knowledge and content knowledge – work together successfully. There are more advantages to knowing the TPACK model. Teachers familiar with the TPACK model can communicate more effectively with others.

(b) Contribution of ICT to teaching and learning in ECE

(i) Positive attitudes toward using ICT in learning

All practitioners from the focus group noted that ICT are available in their school. Most of them realized that, in today's society, our lives are changing technologically and that we need to use technology more often. Schools are faced with ongoing demands for change in the 21st century. Hence, teachers agreed that children should keep up to date with new technologies. In order to adjust to the changing needs of society, preschools have incorporated ICT into their activities (Brito 2010; Maskit 2011; Nir-Gal and Klein 1999, 2004). They believed that ICT could motivate a child to learn. Hence, all teachers in these two cases had positive attitudes towards ICT and agreed that preschool teachers should have the responsibly to let their students start to experience the technology in their early years. These attitudes were reflected in the following statements:

I think children are interested in learning via ICT and believe that computer games

and apps are fun for them. I also believe that computers encourage the children to learn, as their learning is reinforced through good feedback (Miss Yip, Kindergarten B).

Using the Internet can make young children broaden their knowledge and perspectives, so I think this is the reason why more and more preschools have started using ICT in their curricula. For example, the students can experience the ocean when using a computer and projector to present an undersea environment through pictures or photos with animation. This successfully attracts their attention and stimulates their curiosity and interest in the topic. (Teacher Au Yeung, Kindergarten A)

In the past, teachers could not use ICT easily when preparing teaching materials, so they usually used pictures unless the teacher had the ability to travel and record video for the children to learn. But, nowadays, we can find a lot of different resources on the web, such as videos, stories and so forth. This all allows children to expand their vision and their level of knowledge will be raised. (Teacher Lau, Kindergarten A)

We need to be in step with the rest of society, so I think we should implement ICT education in preschool ... ICT are generally characterized as being convenient, resourceful and quick in retrieving information. (Teacher Yip, Kindergarten B)

Most parents like to choose kindergartens which can provide an ICT environment for their children to learn because it is better for the nursery to primary school transition. You know there is much homework that uses ICT in primary schools. (Teacher Leung, Kindergarten B)

These comments are consistent with Li (2006) and the Curriculum Development Council (2006), who state that most preschools have emphasized the importance of ICT in teaching and learning. Li (2006) also mentions that integrating ICT into the early childhood curriculum develops children's awareness of the value of using ICT in daily life. In addition, these remarks are consistent with the literature. Most countries – such as England,

Portugal and Scotland – have policies to support ICT integration into the preschool curricula (Armstrong and Casement 2000; Kuwait Ministry of Education, Plowman and Stephen 2003; Haugland 1999). It is an integrated part of the early childhood curriculum in the world (Yelland 2011; Gialams and Nikolopoulou 2010; Lin 2012). In reality, both kindergartens' teachers in this study should have a good level of TPACK since they had a positive attitude towards using ICT in the curriculum. Nevertheless, the findings in this study do not support this point totally.

(ii.) Developmentally appropriate technology and children's learning

Developmentally appropriate practices must guide decisions about whether and when to integrate technology and interactive media into early childhood programmes (NAEYC 2012). Data from the focus group indicated that teachers thought both new technology and traditional teaching tools have distinctive functions, and professional judgment is required to determine if and when a specific use of technology is age appropriate. Teachers commented on the issue:

> We don't expect K1 students to learn with ICT because they have not yet developed their fine motor skills well. I agree that children at K2 level should start their ICT experience by using the mouse of a computer. (Mr. Ku, Kindergarten A)

> I believe ICT is not developmentally appropriate for children under the age of three. I had a student who always played with an IPad at home who did not have good concentration in class because he was not attracted by still pictures and books in his learning process. (Miss Lui, Kindergarten B)

These comments are similar to the previous research findings that children aged three years old and older can begin to explore and use computers effectively (Elkind 1998; Haugland 1999; NAEYC 1996, 2012). Additionally, NAEYC (2012) points out that

interactions between adults and infants and toddlers are essential to early brain development and to cognitive, social, emotional, physical and linguistic development. Thus, one of the most critical needs identified is support for early childhood practitioners in gaining the knowledge and skills to select and use technology in ways that are appropriate for young children (NAEYC 2012).

(c) Using ICT to motivate young students in learning

The observation and interview data support the idea that ICT can enrich preschool practices because they are technologically attractive, enjoyable and interesting. All the participant teachers in the focus group discussion agreed that teachers should help children keep up to date with new technologies. In order to adjust to the changing needs of society, preschools have incorporated ICT into their activities (Brito 2010; Maskit 2011; Nir-Gal and Klein 1999, 2004). They believed that ICT could motivate children to learn. All the teachers indicate that they did not consider ICT as an 'appendix' to other pedagogical resources, and they supported them as existing teaching practices. They believed that technology that is engaging, motivating and stimulating is age appropriate. From the interviewees it also appeared that:

> ICT are useful educational tools. They can help children construct a concept in their mind, and the use of animation in ICT can increase motivation and make learning more interactive and enjoyable. (Miss Chau interview 2 June and 3 June 2015)

> Traditionally, for instance, I used to search for books with pictures to give students images of the shapes of clouds, but 2D effects are not easy for them to understand. Now I can do it on a digital screen! Obviously, ICT can let teachers do more, but you need to know what and in which ways. (Miss Kwok 17 June 2015)

Similarly, observations supported the idea that the teachers used ICT to acquire knowledge and resources in teaching. On several occasions, for example, teachers employed YouTube to find pedagogical resources such as images and videos. In one instance, teacher Y (3 June 2015) used music from YouTube to assist students to develop music appreciation skills. In addition, teacher L (19 June 2015) also searched for photos of mosquitos and cockroaches as well as governmental hygiene posters for students to observe and learn. Both of them believed in using ICT as a way to attract young children's attention. This corresponds with the claim in the literature that ICT motivate both teachers and students. There appears to be some consensus that ICT use in the classroom greatly contributes to students' motivation and engagement in learning (Lim 2012; Yelland 2011; Maynard 2010).

(d) Using user-friendly resources

(i) Free online resources

The focus group discussion revealed that most of the teachers thought that they were responsible for the implementation of ICT in their teaching. ICT have become an important part of the curriculum in Hong Kong preschool settings. Apart from using a digital storybook, all the teachers from the two cases remarked that they integrated ICT into their theme and project learning. When doing project learning, they require students and parents to search for information on the Internet at home and bring this back to school for sharing. In addition, they also like to search for useful clippings to use in connection with different teaching themes.

All the teachers agreed that it is convenient to search for some online resources for their teaching to find useful information related to curricular themes. For example, one of the kindergarten teachers said:

> We just had the topic of 'peacock' in the last few weeks; we found some useful video clips about peacocks on the web, such as how the peacock displays his feathers to attract a mate. I think the advantage of the video is providing a concrete image for the children to learn. (Miss Au Yeung, focus group, Kindergarten A)

> ICT can provide immediate information for students' learning. For example, if I want to share some recent news with my children, I can search for the news on the website immediately. (Miss Ching, focus group, Kindergarten B)

Regarding the use of ICT in teaching, the observations and semi-structured interviews indicated that all the teachers agreed that ICT helped them prepare their lessons, and they kept searching for online resources for their teaching. Teachers tended to use computers quite frequently, as well as projection systems and online video clips during their lessons; however, they did not use other ICT resources frequently. In six of eight observations, online teaching materials were used. Teacher C used pictures found on a website to make a simple digital story. Furthermore, she also found an interesting online game that helped students understand the process of evaporation.

In addition, I found that all the teachers used YouTube videos for their lessons. These videos were the most popular among the preschool teachers. For example, teacher Yip said:

> I often search for interesting news, pictures and video clips online ... to elaborate and express the given issues in concrete ways, especially for YouTube. ... It is a very helpful online resource for preschool teachers to find some interesting clips for teaching. (Teacher Yip, Kindergarten B, individual interview)

> YouTube! I Love it! I use it to prepare my lessons because there are many useful videos that fit our teaching themes. I think preschool teachers today commonly use the web and YouTube. (Teacher Leung, Kindergarten B, individual interview)

The data from this study show that YouTube is the main resource for most preschool teachers for learning materials.

(ii.) Popularity of using PowerPoint when making teaching materials

Teachers from the two cases pointed out that they liked to create digital teaching resources using PowerPoint. Teachers from Kindergarten A noted that educational software in Chinese language is less appropriate, and most are in English, so they produced some of their own games and activities using PowerPoint for their students. Besides, PowerPoint is user friendly and can incorporate several multimedia elements, including still images, graphics, texts, sounds, music and interactive functions. For example, teachers can make a digital picture storybook by scanning pictures from an existing paper picture storybook, typing the text for narrative description, creating sound or background music to amplify the effect and aid the interactive function to control the sequence of the story pages (Lin 2012). The teachers who participated in the focus groups explained the ways in which they use PowerPoint slides:

> Due to our school's implementation of the 'storybook teaching approach', teachers in our school like to use PowerPoint to make some stories and games for pupils, as it is very user-friendly software for us to create an interactive story and games. I also used its function to make an e-poster with pupils. (Miss Wong, Kindergarten L)

> We try to prepare simple digital teaching materials by using PowerPoint. I found some pictures to insert into PowerPoint to make a simple e-story! It was very easy to do, and teachers do not need to spend too much time preparing teaching materials. (Miss Leung, Kindergarten C)

I like to insert some digital photos which I found on the Internet into PowerPoint to make learning materials for my class. (Miss Hui, Kindergarten B)

This study indicates that PowerPoint is the only resource teachers use for making digital materials, especially for digital storybooks, which can be easily made by Microsoft PowerPoint and thus has been adopted frequently for school instructional use (Sancar-Tokmak et al. 2014). This finding raises questions about the need to provide teachers fully with resources to develop the required level of technological and pedagogical content knowledge (Mishra and Koehler 2006) to take advantage of ICT resources fully in teaching.

(iii.) EVI educational platform

As indicated in the interview, Kindergarten A participates in the paid EVI educational platform, which is an online learning platform company. Miss Lau said, 'In fact, teachers can choose useful activities from the platform which fit their learning theme, and then parents and children can enter the platform for learning at anytime and anywhere'. In addition, Mr. Ku said, 'There is a computer corner in every classroom which is linked to an online platform named EVI. We found that EVI can have more visual and audio resources to facilitate children to learn actively'. Teachers like to use this resource to provide students with more opportunities to interact with technology. This school uses technology effectively in its classrooms.

However, Kindergarten B does not participate in any educational platform because it lacks the financial resources to do so. The teachers commented that they need more time and effort to search for useful ICT teaching materials to fit their curriculum. Such obstacles affect the effectiveness of teachers when using technology in the classroom. This means that they cannot fit the three components of the TPACK model easily into Kindergarten B

(Koehler and Mishra 2008). During the observation, teacher C opened the computer corner for students to play free online games. Hence, the ICT teaching resources for teachers preparing their lessons of Kindergarten A are better than those of Kindergarten B.

***(e.)* School support of ICT use in the classroom**

(i) School policy: Collaborative curriculum planning vs. class-based curriculum planning

Data from the focus groups revealed that the two school principals encourage teachers to utilize the equipment in school; however, they do not set any ICT policies, restrictions on or guidelines for the requirements of ICT integration in teaching and learning; thus, teachers are given the freedom to decide when and how to use them in their curriculum according to students' needs and the teaching theme.

The interviews revealed that school A has a culture of sharing ideas and curriculum design among teachers. Teachers K and L said that when they have difficulties in designing curriculum and teaching materials, teachers who teach the same age group have a meeting to discuss and brainstorm ideas. One participant remarked, 'if I do not have any good ideas on using multimedia resources, colleagues give me support! In this circumstance, I am willing to think more about how to integrate ICT into our teaching'. After implementation, the teachers provide comments on the resources that they think beneficial for learning. Moreover, the teachers generate more multimedia resources for the kindergarten.

However, in Kindergarten B, teachers design and prepare the curriculum individually, as reflected in teachers C and Y's comments. Technology is seen as a complementary learning material to enrich teachers' practices, which depend on the experience and knowledge of individual teachers in their school. Interestingly, the culture

of collaboration among the teachers has been cultivated in Kindergarten A to help them use more efficient and effective ICT in students' learning.

(ii) ICT environment

ICT nowadays are recognized as tools that can foster knowledge and experience for this crucial age and the support of specific areas in kindergartens. Yidirim (2007) claims that access to technological resources is the key factor for teachers to use ICT in their pedagogical practices effectively. Thus, it is necessary to have effective ICT tools so that teachers are encouraged to use them in their teaching. In fact, teachers in Kindergarten A indicated that their school has invested a vast amount of money in the establishment of ICT infrastructure and installation of ICT facilities from 1998 to 2000. ICT equipment is upgraded every two to three years. But Kindergarten B does not have sufficient money to purchase or upgrade its ICT equipment. In the long run, this has affected the teachers who have adopted ICT in their curriculum planning.

I observed that there were two computers, a projector and projector screen, in each classroom of Kindergarten A, and they also had a computer room for use in ICT group activities. Every classroom in Kindergarten A had ICT equipment to support teachers' teaching and students' learning; even the music room and hall had enough ICT equipment to support school teaching. Teachers said 'the students can use all the equipment (e.g., scanner, printer, microphone, and so on) if they need to'. From observing the use of ICT by the two teachers in Kindergarten A, I found they were able to decide what ICT to use to enhance students' learning. Teachers used a laptop PC, CD player, projector, scanner and voice recorder freely to support their own teaching.

Conversely, there are only three old computers in the computer corner of the Kindergarten B classrooms. They have no computer room for teachers and children to use,

and only one projector and screen in the school hall. Miss Lui (Kindergarten B) pointed out that ‘we rarely use it to teach because it is not convenient for us, and we just use it for the whole school birthday celebration activities once per month’. NAEYC (2012) emphasizes that effective use of technology and media is active, hands-on, engaging, and empowering; gives the child control; provides adaptive scaffolds to ease the accomplishment of tasks; and is one of many options to support children’s learning. Data from Kindergarten A showed that the ICT environment supported teachers integrating it into their lessons, whereas Kindergarten B can do less.

Indeed, teachers in Kindergarten B do not use ICT as frequently or as effectively to assist their teaching. In general, they simply use the television in the classroom to enlarge a scanned storybook to tell a story. As Miss Leung of Kindergarten B said, ‘teachers in our school prefer to use scanned storybooks to teach our students’. She added, ‘there is no other ICT equipment in their school for children to use, such as a printer or a scanner’. In Kindergarten A, teachers provide more varied ICT integration activities to their students. Kindergarten A teachers provide some examples as follows:

> I put a digital camera in a theme corner to set up a ‘diving activity’. Children in this corner could use the digital camera to imitate taking pictures under the sea. (Miss Kwok, Kindergarten A)

> For the K3 students, we made riddles together. They tried to use a pen recorder and a computer to record sound by themselves. (Miss Lau, Kindergarten A)

> I scanned students’ pictures and used software to make some stickers for them. When they saw the product, they were very happy! (Miss Lam, Kindergarten A)

(f) Roles of teachers in using ICT

(i) ICT integrators

Based on the framework of TPACK, ICT integration should contribute to children's learning and development. Data from focus groups, observation and individual interviews also revealed that ICT are meaningful tools and resources in the process of teaching and learning when the choice of technology matches the curriculum goals and supports the pedagogy of the lesson. In both kindergartens A and B, teachers indicated that they are ICT integrators because they use technology to search for information, collaborate, explore and extend their findings through different integrated activities. Yet, the level of integration depends on the professionalism and sensitivity of each teacher; ideally, teachers should balance ICT usage and the learning content. For example, as discussed above, teacher C in Kindergarten B was not able to have a good balance between content, pedagogy and technology. But after her reflection on the first day of teaching, she performed better during her second observed lesson on 3 June 2015 because she thought more about integrating interactive elements between technology and students in her curriculum. These findings support TPACK theory (Koehler and Mishra 2005; Mishra and Koehler 2006; Thompson and Mishra 2007) in which the deeper the understanding of the inter-relationships of TPACK a teacher has, the more effective the integration of ICT demonstrated by the teachers. In the case of Kindergarten B, teachers not only have simple technical competence, but also have content knowledge, pedagogical knowledge and reflective knowledge, improving their level of TPACK.

(ii) ICT resource providers

After the observation, I found that it is important to select age-appropriate technology because doing so will make children more active in their learning. Thus, the role of ICT tools in preparation is vital. Technologies used in the lesson should be strongly aligned with the curriculum goals, and teachers should consider the availability of ICT resources in the class. Nevertheless, by comparing the use of resources provided by the two schools, it was found that teachers' use of ICT depends on the ICT environment and teachers' capacities regarding TPACK. For example, teacher L demonstrated to young children how to use PowerPoint and worked together with them to create an e-poster. In that case, she enhanced the interaction between students and students and teacher and technology, showing that she is a good ICT provider. Also, teachers are capable of using search engines, such as Google and YouTube, to locate the information they need for children's learning.

(iii) ICT guider

Because of the rapid development of technologies, children's lives and ways of learning have changed in the past ten years (Hsin, Li and Tsai 2014). Teachers recognize that adults should set rules limiting the time that children play on computers and other devices, such as tablets or mobile phones. Some literature (e.g. Yelland 2007; NAEYC 2012) mentions that there are also areas of serious concern related to overuse of technology in young children's lives, such as computer addiction problems (Lentz, Seo and Gruner 2014; NAEYC 2012). The following comments from focus groups highlight some of the consensus views regarding the importance of rules for young children:

> Teachers should limit students' play time on computers and tablets, avoiding their addiction to IT games and apps and the reduction of social interaction, as well as the effect of on their sight. (Miss Ching, Kindergarten B)

> Children learn to use ICT at a very early age. I observe that most parents like to use their smart phone or tablet to entertain their children even if they are just babies. I don't want my students to be controlled by ICT, so I do believe that children need to have adults guide them. (Miss Leung, Kindergarten B)

> If teachers do not supervise their children, they will play on the computer excessively. (Miss Suen, Kindergarten A)

(iv) ICT facilitator

The facilitating role of teachers is important in ICT teaching and learning in preschool settings. Children learn more from using ICT when teachers provide them with a safe environment, encourage them to participate in conversation, involve them in establishing the goals of the activity, and maintain their interaction with adults and the technology (Hsin, Li and Tsai 2014). All the observed teachers and teachers from the focus groups expressed the idea that they were central to the learning process when utilizing ICT in the classroom (especially those related to lesson planning, preparation and follow up). Comments by participants are consistent with the literature that the decision about using ICT should be based on teachers' classroom decisions on what students really need (The Alliance for Childhood 2012; NAEYC 2012). Most interviewees indicated that they are ICT facilitators. In one instance, teacher K said:

> I would like to help students to take pictures of their poses in an activity. The pictures were printed and hung up on the wall; thus the other students who had not participated in this activity could follow and discuss. (Teacher K's interview on 17 June 2015)

Teacher Y also stated, ‘I was able to use suitable video to facilitate students’ understanding the differences between kindergarten and primary school. The game is interesting to guide the student to learn (interview on 2 June 2015).

Miss Ku said, ‘Young children can easily browse websites by themselves nowadays, but some information from the web is wrong, so we should guide them to filter the information’ (Kindergarten A, focus group).

(g) Barriers to ICT implementation into curricula

(i) Lack of access to resources

Teachers from Kindergarten B noted that their school has experienced substantial difficulties in raising funds to enable construction of ICT infrastructure, purchasing some new ICT equipment and software, and providing maintenance for the ICT hardware. Therefore, teachers in their school could not easily use ICT in their teaching. Khan, Hasan and Che (2012) agree that the effective use of ICT requires the availability of equipment, such as supplies of computers, their proper maintenance and other accessories. In addition, teachers are less enthusiastic about using ICT where the equipment available is old and unreliable (Preston et al. 2000). This situation is apparent in Kindergarten B. In all the classroom observations with teachers C and Y, they could not use the projector system to project the teaching materials on the screen. Instead, they showed materials to the students on the television. They explained that they sometimes are unwilling to use ICT because of the lack of the necessary equipment in their classroom. However, during the observation of the teachers in Kindergarten A, they all could easily use the projector system anywhere in the music room, hall, computer room or classroom. Teachers L and K commented that they rarely encounter resource issues in their school because their organization is willing to spend money on students’ learning. Clearly, the availability of

ICT resources is an important factor that influences the frequency with which preschool teachers use ICT.

(ii) Lack of time

All teachers agreed that using ICT increased their workload so that they need to spend more time to prepare the e-teaching materials than traditional ones. Many teachers indicated that they did not have time to even think about integrating ICT into their classroom's practices. Additionally, the shortage of class time was another significant barrier discouraging teachers to use ICT in the classroom. Teachers expressed the concern that the academic orientation of Hong Kong preschools, with only 3 hours for learning, results in limited time to use ICT in the overcrowded curriculum. This is similar to the findings of Ho (2008) and Li and Li (2004) that some preschools apply a tightly structured curriculum schedule so preschool teachers have no time to use ICT in their teaching (Li 2006). Comments by teachers are also consistent with findings from previous research (e.g., Khan, Hasan and Che 2012; Keengwe et al. 2008).

(iii) Overload for the preschool teachers

The four observed teachers encountered challenges as they selected software to use in the classroom. In eight classroom observations, teachers mainly prepared the ICT teaching materials themselves. For example, teacher L scanned all the students' posters in PowerPoint, and teacher Y searched for classical music on YouTube, and so on. They indicated that they needed to spend more time on the preparation. Besides, teachers from both schools agreed that using ICT increased their workload in that they needed to spend more time to prepare the e-teaching materials than when preparing traditional lessons. According to Sicilia (2005), the most common barrier reported by all the teachers is the

lack of time they have to plan lessons with technology, explore the different Internet websites or look at various aspects of educational software.

(iv) Technical problems

In addition to the issues discussed above, teachers in Kindergarten B agreed that technical support is a main barrier to their integration of ICT into their lessons. Comments from these teachers included 'Lack of technical back-up' and 'We need an on-site ICT technician to support teachers in lessons'. During the group discussion, teachers of Kindergarten B explained that they could not seek technical assistance when the computers and television failed or needed to be updated, so this affected their use of ICT in class. Once a breakdown occurred, the lack of technical support meant that the equipment remained out of use for a long period of time. An example of this was highlighted by Miss Hui: The television broke and took three to four months to be repaired. Lacking technical maintenance services was considered by Kindergarten B's teachers to be a significant obstacle, as it leaves their ICT equipment broken for a long time, influencing its use in teaching. Similarly, teacher Y on the two observation days used teacher C's classroom because the television in her classroom was damaged for a week and there was no IT technician on hand to help. She could only use the other classroom for teaching when she needed to use the television. Thus, she said having an 'on-site ICT technician is very important for our teaching. Otherwise, it would affect our determination to use ICT in our classes'. Besides, in the second observation on 3 June 2015, teacher Y also encountered technical problems regarding microphone volume and connection speed which caused her to change her lesson content temporarily. The absence of technical support services seemed to discourage teachers in Kindergarten B in their use of ICT for teaching.

In contrast, the situation in Kindergarten A was better because they have technical support providing assistance for their school when they face ICT issues. Teacher K stated that she sometimes had difficulties with the ICT equipment, but 'the IT technician is able to come immediately, so I am happy to use ICT in my teaching'. Hence, the availability of technicians facilitated teachers using ICT devices in their classrooms. The BECTA (2004) study also emphasizes that technical support is needed in schools to avoid the fear of equipment breaking down in a lesson which affects teachers' usage of ICT.

(v) Lack of ICT training for pre-service and in-service teachers

The lack of teachers' ICT-related pedagogical competences has been pointed out to be among the main obstacles to technology's use in teaching (Afshari et al. 2009). Therefore, in order to integrate the technology into teaching, teachers should receive adequate training for this (Rodríguez, Nussbaum, López, and Sepúlveda 2010). However, in their interviews, teachers C and K acquired teacher qualifications through preschool training, and teachers Y and L received training after they started work as kindergarten teachers, but they said that they had no ICT training in integrating ICT into lessons during the whole ECE programme. Therefore, how the teachers learn to integrate ICT in their work depends on their experience and knowledge.

Data from the focus groups indicate that teachers believe that the government should provide more pre-service and in-service technology-related training to teachers so that they become more familiar with ICT to facilitate children's learning. Teachers said they would like some practical training on how to integrate ICT in teaching and learning:

> I had some ICT courses in my preschool teacher training, but they were useless for me because the software that was taught in the course was not free, and our school has no money to buy the licence for teachers to use. (Miss Hui, Kindergarten B, focus group)

> I have attended the training courses run by private IT companies, but they were about general computer skills rather than using the technology for educational purposes. Thus, due to the lack of courses, many practitioners are self-taught. I just seek help from colleagues when I do not know how to tackle the technological problems. (Miss Suen, Kindergarten A, focus group)

Professional development activities should focus on developing teachers' technological knowledge and technological-pedagogical knowledge (Law 2009; Yuen et al. 2010). Teachers may have difficulty understanding the complex relationships between technology, pedagogy and content because these are taught in isolation in most teacher education programmes (So and Kim 2009). Therefore, it is important to teach the TPACK framework through these teacher training courses effectively because the TPACK framework offers teachers a way of thinking about educational technology by emphasizing how such technology interacts with both pedagogy and content (Mishra et al. 2009). Preschool teachers should know that technology integration requires more than a single pedagogical orientation, and it should include a spectrum of approaches to teaching and learning.

(vi) Absence of ICT policy

ICT policy is another significant factor influencing teachers' levels of ICT use. Based on the focus group, most of the teachers in Kindergarten B did not know how to answer the questions related to ICT policy. Only one of them indicated that they followed the Guide to Pre-Primary Curriculum (Curriculum Development Council 2006) to design its curriculum, and there are no clear guidelines on implementing technology in teaching. Again, they also indicated that their school has no established written policy to guide classroom practices for effective use of ICT at teacher level. In Kindergarten A, the situation

is better because most of the teachers mentioned that their school has formal documents related to ICT policy, issued by their school principal, which stipulate that they need to try to integrate ICT into teaching themes and content.

4.3 Conclusion of the findings and discussion

With the fast development of the Internet, the use of communication technology has changed greatly. Young children live in a world enveloped by technologies and use technologies in their daily life (Hague and Payton 2010; Plowman, Stevenson and McPake 2013). Much previous research explored primary, secondary school or university teachers' attitudes toward their usage of ICT in schools (e.g., Karasavvidis 2009; Al-Senaidi, Lin, and Poirot 2009); however, there are few studies regarding preschool teachers' views on or intentions to integrate technologies into early childhood settings (Gialamas and Nikolopoulou 2010). Moreover, there is limited research on the topic of ICT integration into early childhood settings, and thus this gap in the literature gave me an opportunity to explore this topic more and contribute to the field of early childhood education in Hong Kong.

As an early childhood teacher educator, I have a large number of opportunities to work closely with preschool principals and teachers in professional development training courses and collaborative projects. I have taught Information and Communication Technology in an Early Childhood Education Curriculum module for 10 years. This has helped me to understand the development of ICT in the field of pre-primary education. When I spoke with my students, who are pre-primary school principals and teachers, I became aware that ICT is still not integrated as part of the teaching and learning in the Hong Kong pre-school educational context; instead, it is used mainly when children have leisure

time. To date, an increasing number of young children spend hours each day sitting in front of screens instead of playing outdoors, reading or getting much-needed physical exercise and face-to-face social interaction. This reflects the social trend of using technology for young children's learning. Again, some of the literature reflects that preschool teachers have no clear guidelines and principles to integrate technology into their classroom teaching. Therefore, to resolve the situation of poor performance in this regard, it was valuable for me to conduct in-depth research to further contribute to both research and practice in the field of ECE.

Through this small-scale study of how preschool teachers integrate computer technology into kindergarten classroom teaching, I gained a greater understanding of the situation of ICT use in preschool settings and deduced various types of integration to construct a model which is suitable for preschool classrooms. From the study, it can be concluded that most teachers have a good understanding of their role of integration of ICT into preschool curricula. Also, it was found that once preschool practitioners believe that the integration of computer technology is no longer a difficult task, they will be more confident and willing to adopt computer technology in their teaching.

In addition, the findings of this study indicate that cooperative curriculum planning, technical support, professional development and good technical infrastructure are the main factors to facilitate teachers' adoption of technological advancements and affect their capacities of TPACK. Currently, the notion of TPACK is spreading and being adopted by many countries to understand and enhance teachers' ability to integrate ICT (Chai, Koh and Tsai 2013a). As Mishra and Koehler (2006) advocate, TPACK in teacher education describes the knowledge base teachers need for effective technology integration. Since then, the TPACK framework has had an impact on teacher education and professional

development, as well as influencing theory, research and practice. A better understanding of teachers' beliefs and TPACK can help to improve the efficiency of teacher education programmes (Dong et al. 2015). Thus, I suggest that future professional development programmes should employ the TPACK framework, and future preschool teachers should be more sensitive to the demands of utilizing technology in age-appropriate ways in order to facilitate opportunities for students to learn and develop.

The results from the focus groups regarding use of ICT by 15 practitioners from two kindergartens go some way towards answering the research questions, and observation and interviews of four practitioners from two kindergartens further answered the research questions more deeply. The analysis of results found that the teachers all agreed that it is important to use ICT in early childhood education. They believed that ICT is essential to their teaching and are willing to use it in class. According to Magen-Nagar, Firstater and Schwasbky (2013), the main catalyst for the successful implementation of ICT in education are teachers' positive attitudes towards the role of ICT in teaching and learning. The comparison between Kindergartens A and B showed that ICT background aspects (school support, ICT environment and resources) are likely to affect their choice of teaching strategies and the implementation of innovative technologies. Positive attitudes of teachers K and L in Kindergarten A contributed to the more successful implementation in their curriculum.

4.4 Summary

Findings from the focus group, classroom observation and semi-structured interviews revealed that the successful use of ICT in teachers' classrooms depends on personal and institutional factors. These factors influence preschool teachers' TPACK

knowledge and the effectiveness of ICT implementation. Chapter five will present conclusions, implications and recommendations for future research.

CHAPTER 5 CONCLUSIONS AND IMPLICATIONS

5.1 Introduction

This chapter provides a summary of the three research questions and recommendations. I begin the chapter with a brief review of the study encapsulating the research purpose, research questions, literature review, methodology and research findings. Then discussion will explain the implications and recommendations for teaching practice and future research.

5.2 Study overview

The two qualitative case studies investigated two Hong Kong kindergarten teachers' views on integration of ICT into preschool settings. The primary purpose was to examine the practitioners' views on integrating technology into their teaching to engage the young children and what the barriers are that they face in their school. The literature review provided an understanding of the historical development of ICT used in Hong Kong preschools, the importance of the TPACK framework in designing lessons, arguments on the influence of young children's use of technologies on their development, and the barriers influencing the implementation ICT in different countries. Figure 5.1 shows the study's research questions, overall key findings and related discussion points, and provides links to the study's conclusions and recommendations.

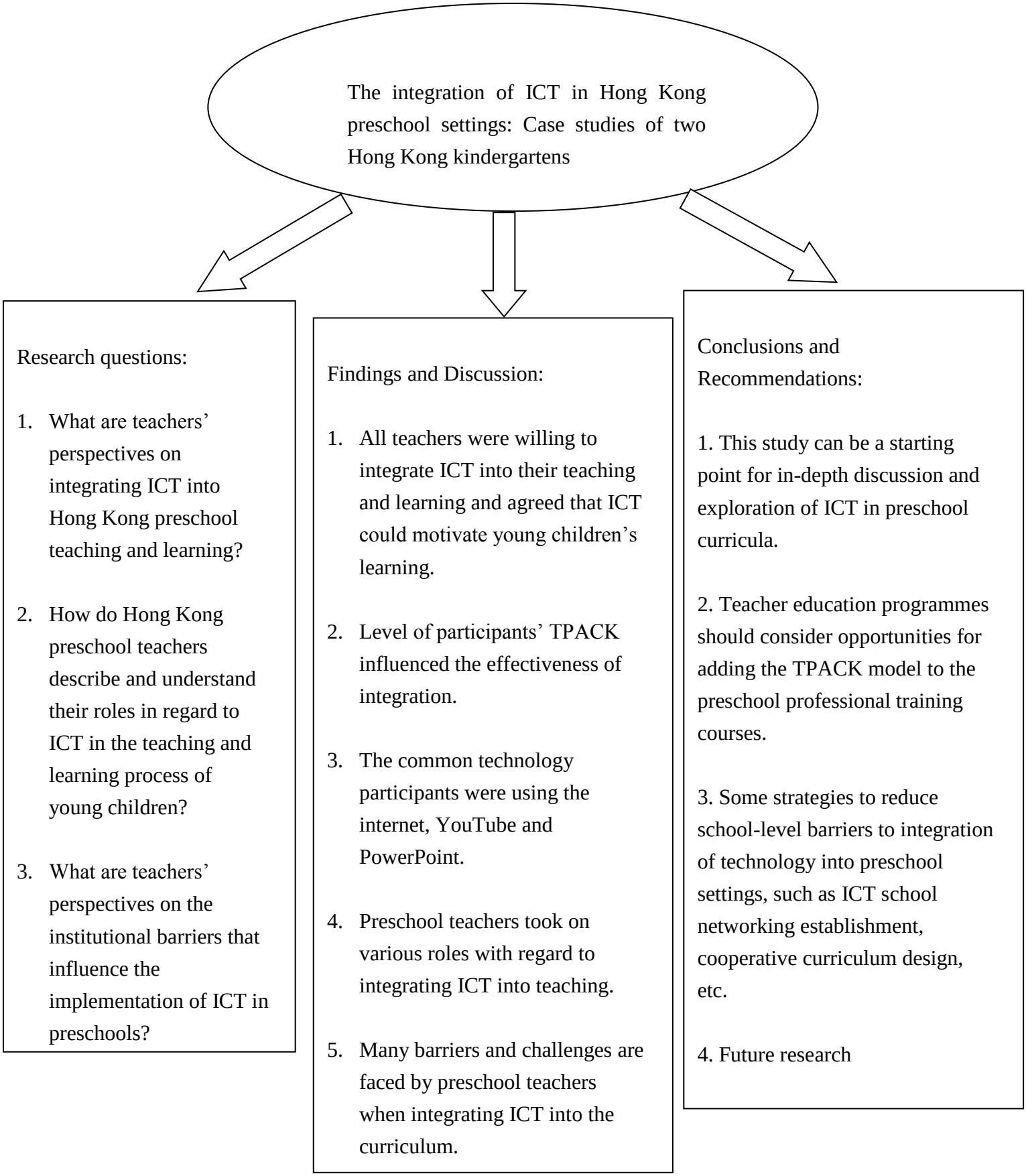

Figure 5.1 *The overall research questions, finding and discussion, and the conclusion and recommendations of this study*

5.3 Summary of the Research Questions

5.3.1 Summary of Research Question 1

RQ1 asked: What are the teachers' perspectives on integrating ICT into Hong Kong preschool teaching and learning?

This research question considers teachers' perspectives on using technology in teaching and learning. The findings show that most of them agree that ICT is necessary in their teaching and good for motiving young children in their classroom when they integrate it in a developmentally appropriate way. However, the level of their TPACK influenced the effectiveness of integration. Mishra and Koehler (2006, 2008) articulate the importance of knowing the connection and interaction between content, pedagogy, and technology, and noted that for this to happen, teachers should have a systematic understanding and respect for each component and how they work together. In the observed lessons, each teacher in this study incorporated components of the TPACK model of instruction but did not all meet the level of it based on their observation by using the Technology Integration Observation Instrument, especially Kindergarten B. For example, teacher C is a new teacher, having taught for one year, and she primarily used visual and auditory means to deliver instruction. There was a lack of interaction between the content, pedagogy and technology. The appropriate professional development should be offered for preschool teachers that would allow them to develop an understanding of TPACK. Teacher Y's integration of technology was not smooth because of the unstable Wi-Fi problem, so she seemed to find it difficult to integrate technology, pedagogy and content knowledge.

In addition, ICT is used to support preschools during their teaching practice in these ways: using online resources and using collaborative curriculum planning. Interestingly, the result of this study revealed that the common technologies that most of the participants

reflected that they often use are the Internet, YouTube videos and PowerPoint to integrate ICT into their lessons. It seems that preschool teachers like to use some user-friendly, free and simple technology tools, especially the YouTube clips in their teaching.

Further, the study revealed that preschool practitioners should appropriately utilize the advantages of ICT and effectively integrate technologies appropriately into the curriculum. Teachers in Kindergarten A also indicated that they need to strike the right balance with ICT and non-ICT teaching strategies and between screen play and actual play. Therefore, they have to collaborate with each other to advocate more appropriate technological applications for all children. In other words, it is extremely important for the early childhood teacher to be aware of childhood developmental principles when deciding how to integrate computers into the early childhood curriculum and to organize the classroom in such a way that encourages more interaction between young children when they are working with computers. As Lin (2012) suggested, a successful integration of computer technology into teaching should not only focus on how many technologies are applied or how often technology is used, but should also focus on how to choose appropriate technology at the right time and place in educational programmes.

5.3.2 Summary of Research Question 2

RQ 2 asked: What are the teachers' understandings of their roles of ICT in the teaching and learning process for young children?

This research question considered the teachers' perspectives on their roles of ICT integration into curricula. The findings reflected their views on the importance of teachers' role of designing, preparing and integrating technology into their classroom. They all agreed that the impact of this technological blossoming has also influenced the lives of

young children. Hence, teachers' perceptions of children's ICT use influence how they support or do not support their children's learning through technology.

In the past 20 years, society has undergone dramatic changes. The Internet, social media and portable devices have transformed the way we connect to friends and family. Preschool teachers are considered to be a central figure in the education process of children, and his or her teaching methods are affected by personality variables, such as beliefs, perceptions and self-image (Magen-Nagar et al. 2013). Some teachers have a positive attitude toward ICT integration into their lessons or engaging children in technology-related activities (e.g., Cviko et al. 2012; Fessakis, Gouli and Mavroudi 2013). In line with the literature on the use of ICT in preschool classrooms, this study emphasizes and confirms the important role played by teachers in regard to integrating ICT into the ECE curriculum. Findings revealed that teachers take on various roles with regard to integrating ICT into teaching, including ICT integrators, ICT resource providers, ICT guider and ICT facilitator.

5.3.3 Summary of Research Question 3

RQ3 asked: What are the barriers to ICT integration in preschool settings as perceived by the principals and teachers?

This section will explore the kind of factors that influence ICT application in classrooms, and how preschool teachers integrate technology into teaching and learning. Thus, the research question considered the barriers that teachers face in the classroom. The findings show that there are many challenges faced when integrating ICT into curricula.

Even though this study found that it is not uncommon to implement ICT in early childhood settings, practitioners in the interviews reflected that they experienced some

difficulties and challenges in integrating ICT successfully into teaching and learning, especially for Kindergarten B. The participating teachers appeared to have a lower level of TPACK knowledge that is linked to a number of barriers. This view is also in line with some key findings from BECTA (2004): (1) recurring technical faults and the expectation of faults occurring during teaching sessions are likely to reduce teacher confidence and cause teachers to avoid using ICT in future lessons; (2) there are close relationships between the factors. For example, teacher confidence is directly affected by levels of personal access to ICT, levels of technical support and the quality of training available (p. 3-4). These barriers stop preschool teachers using ICT in their classroom.

5.4 Implications for ICT teaching practice

Additionally, this study found that, although most of the teachers are enthusiastic about the integration of ICT, they are constrained by lack of time, funding support, software and technical problems. Thus, apart from ICT training progammes, researchers have provided some main suggestions on these issues:

(i) Funding

Acknowledging that there can be a negative impact on learning and development when educators lack the needed knowledge and skills to do so, the importance of providing resources, guidance, and support for teachers becomes even more pressing (NAEYC 2012). Data from Kindergarten B teachers show that some schools have less money to invest in ICT, so the government should spend more resources on the development of ICT education in preschools. The teachers commented about the limited technologies that their school could afford to buy and the employment of IT technicians. However, when schools have financial support, they are able to provide on-site technical support to minimize problems.

Consequently, the teachers are more willing to integrate sophisticated or new ICT applications into their teaching practices. In addition, I suggest that some organizations or the government could set up three ICT equipment centres in Kowloon, the New Territories and Hong Kong Island for ECE in Hong Kong. This centre could lend ICT equipment, suitable software, and have ICT integrated curriculum enquiry services for preschool teachers in order to share resources centrally. Moreover, it would be easy to collect feedback from preschool teachers on the implementation of ICT in their curriculum.

(ii) Training

Data reported a lack of training in ICT for preschool teachers. The findings of this study show that many teachers attend technology training but still need more training that addresses their needs effectively. Therefore, in order to integrate new technology appropriately into the preschool learning environment, teachers must be fully trained and supported by school or institutions continuously; they should have a follow-up visit by a relevant organization for further support.

This study might also provide preliminary value for evaluating how preschool teacher participants' apply the TPACK framework in their lessons; however, the findings revealed that if teachers become more familiar with the concepts of TPACK, then it will help them to know how best to integrate technology, pedagogy and subject knowledge into their classroom curriculum in developmentally appropriate ways for young children. Teacher preparation programmes should pay more attention to improving student teachers' knowledge of, skills for, educational technology and ICT integration (Dong et al. 2015). Therefore, the ICT teaching module of the teacher training programme in Hong Kong should not aim just to develop ICT competence, but also to educate preschool teachers regarding the TPACK model. Preschools should collaborate with local universities and the

EDB to strengthen the action research projects regarding application of the TPACK model to improve pedagogical practices.

Moreover, teacher training institutions should organize regularly appropriate and sufficient support for the teachers to enable them to acquire updated ICT skills to incorporate new technologies. Teachers should meet certain standards as part of their teacher training. In addition, each preschool should require their teachers to participate in and pass continuing ICT training to make sure that the ICT standards of each teacher are adequate. Well-trained teachers will have more confidence in using ICT in their teaching. School-based training workshops or courses should provide preschool teachers with opportunities to exchange their views on innovation and the use of ICT. Furthermore, a tea/coffee gathering for the professional development follow-up activities can be held in the school at the end of each ICT professional development day.

(iii) ICT data bank establishment

There are limited studies on the topic of ICT integration into the field of Hong Kong early childhood education. This study can be a starting point for in-depth discussion and exploration of the integration of technology into preschool curricula. Additionally, in this study, all the teachers remarked that they loved online materials, including educational websites and YouTube videos. I suggest that preschool educators in Hong Kong develop a unique preschool databank using online social networking tools, such as Facebook, YouTube, Instagram and so on. These tools would enable teachers to share ICT-related instructional materials, such as videos, audio recordings and photographs. To build an ICT teaching materials culture, every preschool in Hong Kong should broadcast some useful ICT teaching materials via social networking tools, as this would be invaluable.

(iv) ICT school networking

Due to the reported lack of ICT courses, practitioners noted that they teach themselves ICT skills and that discussion and sharing with colleagues enables them to understand how to use technology and integrate it into the curriculum. Moreover, this study discovered that teachers in preschool B are facing more difficulties than those in preschool A. Hence, networks should be established to create opportunities for school pairing to use scaffolding strategies to give more support to the less ICT-aware schools. More communication on ICT experiences, use, and best practices could be beneficial, encouraging critical reflection by teachers on their own ICT teaching practices. I suggest that such sharing should be rolled out to communities. For example, sharing between different schools, secondary to preschool, primary school to preschool, and preschool to preschool should be encouraged for the teachers.

(v) Time allocation

If technology is to be used as an instructional tool, time spent on ICT resources design for the early childhood classrooms and pedagogy and the curriculum should be acknowledged (Ntuli, Esther 2010). This study has found that the use of ICT requires a great deal of investment from teachers in terms of time and effort. The teachers indicated that there is not enough time for technology preparation. To address this issue, schools need to allocate time regularly for lesson preparation that includes cooperating in designing the curriculum, pedagogy and instructional use of technology.

5.5 Implications for future research

From the data gathered for this study, several implications for future research are proposed. This study adopted only a small sample size. A further study could include a large sample size to reflect trends in technology integration in Hong Kong early childhood education. Further, going beyond Hong Kong to explore the views about and practices of using developmentally appropriate technology in early childhood education would increase the generalizability of this study's findings.

In addition, it could collect principals' perspectives on the administrators' roles on the integration of implementation ICT in teaching and learning.

The idea of the TPACK model of instruction was introduced by Mishra and Koehler, and they continue to be the leading researchers in the field pertaining to this framework. The findings in this research indicated that TPACK is a very powerful and appropriate model when used as the framework for observing preschool teachers' ICT-related activity. Thus, I recommend future investigation into developing a consensus of teacher educators and to establish standard guidelines for assessing and observing preschool teachers' level of TPACK. In addition, future research could build on this current survey to obtain all seven factors contained in the TPACK model so as to provide a more comprehensive survey of TPACK among preschool teachers.

5.6 Limitations and future study

Limitations included the common critiques of the qualitative research approach. Most importantly here, although the method of recruiting participants and the sample size were appropriate for a qualitative study, the current study employed case studies and selected only two schools as the sample. Thus, the sample size of this study was relatively

small, so the results of this study may not be generalizable to the larger Hong Kong population (Stake, 2005). This means that it is unlikely to be representative of all the Hong Kong preschools in general. Findings of the study will only reflect the attitudes of those kindergarten teachers who have participated in this study.

The study was idiographic rather than nomothetic, focusing on kindergarten teachers in Hong Kong, and generated findings from the local context only.

Moreover, I was a teacher trainer and researcher in this study, which might have made the participants feel confused. They might have hesitated to respond openly or teach naturally. Even though I was as objective as possible in focus group discussions, observation and interviews (e.g., observation data and interview transcriptions were printed and given back to the participants for checking individually), my subconscious bias and expectations might have influenced the participants' teaching performance.

As the researcher, I constructed new knowledge according to my interpretations of the data provided by the participants, coloured by my own understanding of teaching practices and what I have studied about ECE. I have been studying and working in the field of ECE for many years. I have intimate knowledge of kindergartens in HK. Since new knowledge was created from my interpretation and reconstruction of information given by the participants, the resulting interpretive effort was necessarily subjective (Denzin & Lincoln, 2005; Wellington, 2000). I now discuss collective case study, the design adopted in this study.

5.7 Summary

The three research questions have been answered in this chapter. The findings of this study indicate that preschool teachers should enhance their professional development in

regard to using technology in preschool settings in order to improve the learning of our young children.

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Appendix A

Invitation Letter to the Teachers in the Two Schools

I am a senior teaching fellow of the department of Early Childhood Education at The Hong Kong Institute of Education and student at the Nottingham Trent University. I would like to invite you to participate in a study that I am conducting for my dissertation on Information and Communication Technology (ICT) in kindergartens. The title of my study is "The integration of ICT in Hong Kong preschool settings: Case studies of two Hong Kong Kindergartens". The purpose of this study is to investigate what are teachers' perspectives on integrating ICT into Hong Kong preschool settings and institutional barriers influencing the implementation of ICT in school. You are invited to participate in this research study. This study is conducted solely for academic research purposes to contribute to the literature on early childhood education in the area of ICT integration into current curriculum.

If you agree to participate in this study, you will be asked to do focus group discussion with other lower class and upper class teachers within one month that examine your views and experiences on integration of ICT into teaching and learning for the young children (approximately 30 minutes). This process will be audio-recorded and videotaped. Besides, you also have an opportunity to be one of participants in classroom observation (approximately 30 minutes) and semi-structured interview (approximately 30 minutes) on March or April 2015. I will visit you twice to observe your teaching and take notes by using the observation guide and video camcorder to record what have happened in the teaching.

Any information obtained during this study that could identify you will be kept strictly confidential. All raw data including focus group, observation and interview recordings will be destroyed after finishing the study by five years. The findings of the study may be presented at academic professional conference or published in a academic journal, but your name and any other identifying information will not be revealed. You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented. If you would like to know more about the rights as research

participant, please contact me (29488464). Please sign below if you agree to participant in this study. Your help is very much appreciated.

Yours sincerely,

Cheng Yuen Ling, Elaine

Faculty of Education, Nottingham Trent University

SIGNATURE

I _____(Name of participant) understand the purpose and procedures described above and agree to participant in this study.

_____

Signature of Teacher

Date:

Letter and Consent Form Sent to the Participating Teachers (Transitional Chinese)
東華三園田灣幼稚園各位老師:

本人是香港教育學院幼兒教育學系高級專任導師，現為 Nottingham Trent University 的博士研究生， 感謝您有意參加本次的「**學前教師整合資訊及通訊科技之研究**」項目。這是一項關於幼兒教育的學術研究，旨在探討**香港幼稚園教師運用資訊及通訊科技教學的看法、可行性及當中之困難等相關問題**。是項研究將有助教育工作者及政府理解幼兒運用資訊及通訊科技學習的需要和教師的潛在問題。

如您同意參加本項研究，您需要今年內參加一個在 貴校校內舉行的***小組討論***，與其他參加的校內的高低班教師討論關於幼師運用資訊科技教學的情況和問題(需時約四十五分鐘)。同時，您亦需要在下年度約三至四月接受研究員的***個別觀課錄影***(需時約三十分鐘)及***觀課後訪談***(需時約三十分鐘)。

為方便日後研究之分析，我會對小組討論及觀課進行錄影，並對個別訪談進行錄音，而所有影帶及錄音檔案將於本研究完成後五年內銷毀。研究所得的數據將有機會用作學術會議上之匯報和分享，並有機會發表到學術期刊內。若同意參與的話，請閣下填妥後頁教師同意書，以表示閣下是否願意參與是項研究。研究完成後，本人亦非常樂意向參與的教師講解研究的結果。是次參與純屬自願性質，閣下可終止隨時參與是項行動，有關決定將不會引致任何不良後果。所收集的資料只作整體研究用途，個人資料將絕對保密。希望閣下能對此研究給予支持。如閣下對是項研究有任何查詢，請與我聯絡。如閣下想知道更多有關研究參與者的權益，請聯絡本人(29488464)。

Nottingham Trent University 博士生

鄭婉玲 謹啟

二零一四年十一月三日

簽署同意書

本人 _____明白以上所描述之研究目的和程序，並同意參與是次研究

_____

參與教師簽署

日期:

Appendix B

Questions for the teachers' focus group discussion

1. What are your perspectives of ICT integration in preschool environments? Please discuss some examples of ICT integration in preschool environment.

2. Describe your experiences of the integration of ICT in Hong Kong preschool teaching and learning?

3. What are your views on young children using ICT in their learning? Do you agree with this? Why?

4. In your experience, how do you describe the integration of ICT in your school? And how often you and your colleagues use ICT in teaching?

5. What is your understanding of the role of teachers in using ICT in their teaching and learning for young children in Hong Kong preschools?

6. What teaching strategies are effective in helping young children develop? How do you think ICT links with these other strategies?

7. What are your perspectives on the barriers preventing the implementation of ICT in Hong Kong preschools? Why?

8. What are your suggestions for overcoming such barriers?

9. What are your perspectives on the barriers preventing the implementation of ICT in your school? Why?

10. What are your suggestions for overcoming such barriers in your school?

Appendix C

Technology Integration Observation Instrument

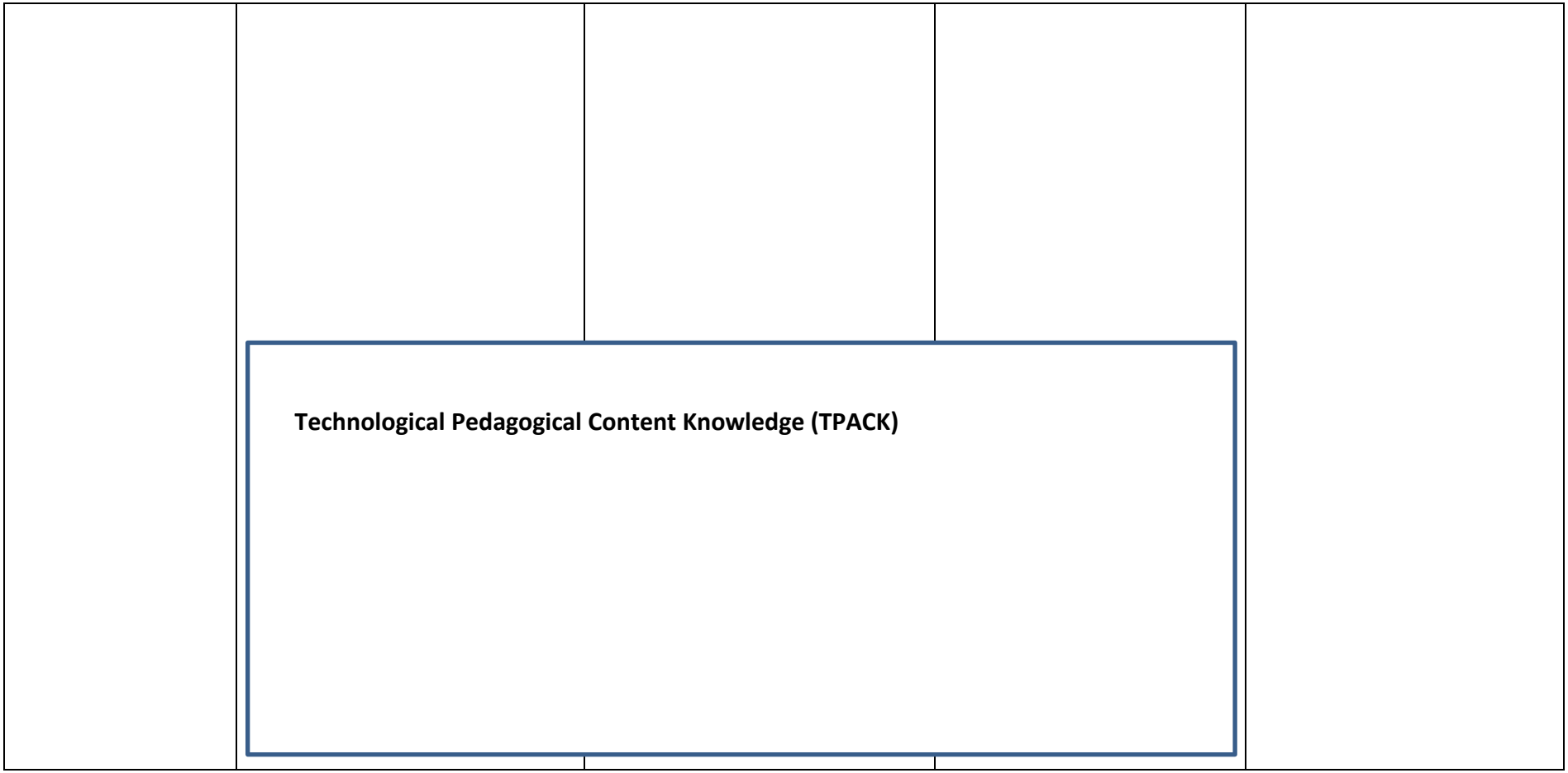
Observer:_____ Observed teacher:_____ School:_____

Date:_____ Time:_____ Class:_____ Group size:_____

Curriculum Theme:_____ Activity:_____

Learning Objectives:	
ICT materials	Non-ICT materials

Content/Subjects	Pedagogical Content Knowledge (PCK)	Technological Pedagogical Knowledge (TPK)	Technological Content Knowledge (TCK)	Role of teacher using ICT in lesson


Technological Pedagogical Content Knowledge (TPACK)

Appendix D

Semi-structured interview questions for teachers

1. How do you think ICT supported the lesson? Please give me examples

2. How you think the curriculum, instructional strategies and technology fit together within your lesson?

3. What are your reflections on the lesson – how do you think it went?

4. Talk me through your ICT use in this lesson – what you did and what you perhaps would do differently?

5. Describe some of the difficulties you have when using ICT in the classroom.

6. What are your main issues with using ICT in the classroom?

Nottingham Trent University

Professional Doctorate

Critical Reflection & Reflexivity on the EdD journey

Title:

The integration of ICT in Hong Kong preschool settings: Case Studies of two Hong Kong Kindergartens

By

Elaine Yuen Ling CHENG

Advisor: Dr Tina Byrom & Dr Ruth Richards

Doctor of Education Program (Document 6)

Nottingham Trent University

May 2016

Introduction

I chose to undertake an EdD for many personal and professional reasons. . I had several reasons to do so. Personally, I wanted to refresh my knowledge about teaching. I am a senior teaching fellow in the early childhood department at The Hong Kong Institute of Education (HKIEd). I thought the EdD would offer me new insights to rethink and update the skills and knowledge that I had. Besides, as HKIEd would be granted university status in 2016, holding a doctorate in education would enhance my future employability as an academic. Thus, these reasons pushed me to set my target to finish my study in four years. However, I did not know what my topic area would be at that moment. There were more than a thousand questions that flooded my mind, and now I am a third year EdD student and in the last stage of my study. As I reflect over the years invested in doing this research work, I could say that every aspect of the study has taken me into different challenging experiences. Some of those experiences were exciting and frustrating. In this document my research journey will be explored through reflexivity and reflection. I present my feelings at the beginning of the study, the importance of reflexivity for my learning, my subjective role in the study, the importance of forming a research cluster and some challenges throughout the process of my EdD research in this section.

What is Reflexivity and Reflection?

Reflexivity involves reflecting on the way in which research is carried out and understanding how the process of doing research shapes its outcomes (Hardy et al., 2001).It is defined as a

critical examination of the researcher's effects on the research process (Reay, 1996). Researchers recognize reflexive research as a methodological tool for shaping, adapting, or otherwise responding to the research process with intention and purpose as the study unfolds (Stronach, Barratt, Pearce, & Pipper, 2007; Underwood, Satterthwait, & Bartlett, 2010). In this account, I will examine some issues which arose as I was undertaking EdD study. This document outlines my journey as an EdD student.

My feelings at the beginning of the study

My story begins with the doctoral research – a study of the integration of ICT in a Hong Kong preschool setting: A Multiple Case Study. There were many 'ups and downs' in my research journey. First of all, I was very anxious as a novice research student since I had studied a coursework Master's degree so I had received very little knowledge on doing research. This seems to be a feature of novice researchers, as Ellis & Levy (2008:p.43) state: "the novice researcher faces numerous challenges when attempting to add to the body of knowledge through an original, scholarly inquiry". For example, I changed my research topic to "The integration of ICT in the Hong Kong preschool setting: Case Studies of two Hong Kong Kindergartens" because when I discussed with my supervisor, Dr Tina Byrom,

she told me that I only used two cases, so it was not a multiple case study project. In this case, I found that it is important to the student-supervisor relationship in supporting the development of my work. As Hockey (1995) has indicated that effective supervision is crucial to doctoral students' successful completion of their thesis. Through the whole process of my EdD journey, my supervisors provided me helpful tuition, guidance, advice and support (Sheehan, 1993; Holloway and Walker, 2000).

A novice researcher can be overwhelmed by the intricacies of the research methods employed in conducting a scholarly inquiry (Leedy & Ormrod, 2005). Luckily, Nottingham Trent University provided doctoral training workshops which gave me a better understanding of what the EdD process was like and what research skills I needed to develop. I could meet my supervisor every two to three months in Hong Kong and that made the study process smoother. On the other hand, talking and discussing with other EdD classmates in every workshop helped me significantly: just sharing ups and downs or hearing about their views or thoughts helped me become motivated again.

Secondly, the number of interviewees during my research proposal stage had to change, as my first proposal was somewhat overly ambitious. Originally, the research questions did not

only target gathering teachers' perspectives, they also included the principals' views to answer my research questions. However, it seemed to focus on the teachers' views on this study to narrow the purpose on collecting data from the preschool teachers first. Research questions should "narrow the purpose [or goal] into specific questions that the researcher would like answered or addressed in the study" (Creswell, 2005, p. 62). Then I should think clearly about the development of my research at the very beginning. Otherwise, I would waste my time collecting, analyzing and writing about the principals' perspectives. By obtaining answers to those research questions, the study goals are met and a contribution towards solving the problem is made (Leedy & Ormrod, 2005). The research questions that I finally arrived at considered the ways that preschool teachers using ICT in their classroom and the difficulties that they encountered. Furthermore, when one starts working on one's project, the topic that one chooses may be too broad, and may need narrowing down because one should make sure that one is really passionate about working on this project for three to four years, instead of the project being the supervisor's choice.

Thirdly, I felt frustrated by my decision to be an EdD candidate because I have two daughters who were only two and four years old when I started my study. They really needed my care more at that stage. They always asked me "Mummy, can you play with me?" and "Can you

stay home with me?" when I needed to attend EdD research workshops on Saturday and Sunday. Besides, there were 16 students in cohort two who fought shoulder to shoulder with me studying on this EdD programme at the very beginning. However, when I came to the research workshop each time, I read the attendance sheets and found most of my friends had withdrawn. In fact, I felt a bit sad and disappointed as there were only 3 classmates at the last stage. Most students said they could not deal with their study and work at the same time. I think how to balance work, study and family is a major problem for an EdD student. This led me to also question whether I could keep going with my own research journey. Was that programme suitable for my level? Could I meet the requirements for graduating within three years? How could I balance my study, work and family? According to Clark's views living a balanced work-family life as "satisfaction and good functioning at work and at home with a minimum of role conflict" (Clark, 2000, p.249). In a similar vein, Kofodimos refers to "a satisfying, healthy, and productive life that includes work, play, and love……(Kofodimos, 1993,p.xiii). Fortunately, I tried out some methods to solve my problems. Being a full time senior teaching fellow, I was given 3 weeks' study leave to 'write up' my research proposal. In other words, I had more dedicated time to produce a first full draft of my research. I also made a decision that I must accompany my two daughters every Saturday, Sunday and public holiday. We took a trip somewhere every long holiday. I think that was good for my

mental health too. Once we have positive balance in three components, including time balance, involvement balance and satisfaction balance, then our individual's quality of life is enhanced (Marks and MacDermid, 1996; Greenhaus et al, 2003).

In addition, I am a part-time EdD candidate so I worried of that it would take me longer to finish my work at the very beginning because I knew other colleagues in my department only used four years to finish their PhD or EdD. Finally, I have learned not to compare my progress with that my colleagues because some of them may graduate within four years. I know the submission of an EdD thesis is like climbing to the top of a mountain. I should climb at my own speed and not compare myself with others. Significantly, if I have good self-discipline, I can easily reach the target. Hence, I tried to manage my time better and I told myself to spend 15 hours a week working on my EdD even if I was tired from my office work and teaching. There were no work phone calls and I could ignore work emails because I studied in the library. From my experiences, good time management and studying in library could make me more concentrate on my study to meet the deadline of all the assignments.

The important of reflexivity for my learning

Continuing to write about my research journey in my research is probably one of the most important exercises in my doctoral study. Through reflexivity, the researcher is not only reflecting on their thoughts but also thinking about factors that influence the way they think, and accordingly altering the way they reach decisions (Johnson and Duberley, 2003; Anderson, 2008). Thus, the EdD contributed significantly to my professional development. This included the time management, documentary resources, analysis of reports, gathering data. It also gave me opportunities to contact some preschools which could increase my knowledge about the field of early childhood education. It was significant for me to write down what I discovered and the new insights in the research process. One should not simply sit and wait for one's supervisor to tell one what to do which is what I did at the beginning. As making use of journals and diaries as data sources, researchers are well advised to keep their own research diary, recording such things as who has been seen, what has been read, trains of thought, hunches and so on (Goodson & Sikes, 2001). After I started keeping a research journal, I could keep all my thought in it. For instance, the preschool principals' interviews were the original plan for my study in order to answer the research questions. However, I changed my thought through writing the research journal because I found it would be better to focus on the teachers' perspective in this study.

The importance of forming a research cluster

I did not enjoy the researcher cluster connections with my colleagues before starting my EdD programme because I was not quite sure how to interpret what they said. For example, when they were arguing the pros and cons of qualitative and quantitative approaches, I could not provide my opinions about this. Therefore, some of my colleagues would not talk to me about their research. They probably thought I could not contribute to their research or project. Nonetheless, when I became an EdD candidate, I liked to talk about my research with my colleagues because I believed that I was surrounded by very smart people who could help me develop my research in a number of ways. These connections between people and the cultural context in which they act and interact in shared experiences (Crawford, 1996) and also with Wenger's notion of apprenticeship to enable the novice researchers to learn their profession from the experienced researchers (Wenger, 1998). At times when some people knew more, and others knew less, the roles of mentor and apprentice benefited less capable peers. My research sometimes could get to the good ideas through the bad ones when I talked and discussed with others. In fact, I got a tremendous amount out of the conversations with the research cluster.

Additionally, a research community of practice (CoPs) (Wenger, 2007) is a social vehicle. It consists of "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2007: p.63). In the CoPs, people share domains of interest, knowledge, resources and emotional support (Wenger, 2007). Encouragement was the most powerful source of influence for me to keep going in my research journey. For instance, my friends knew I was worrying about the coming viva examination. They provided me with more advice that I should take this opportunity to discuss my work with an expert. Then my argument could be improved and I could consider publishing my work in the future. At that moment, I would probably be the world expert on the specific topic of my study. They also reminded me to stay calm and relax in the viva examination and then to try my best to demonstrate the depth and breadth of my knowledge.

The subjective role of the researcher

Reflexivity acknowledges the subjective role of researchers by exposing it to scrutiny (Gilgun, 2006; Rolfe, 2006; Ritchie and Lewis, 2007). As part of the research process, my beliefs, values and experiences influenced my study design. My professional preschool teacher education trainer experiences influenced my dissertation research topic. My beliefs, values, perceptions and life experiences also influenced my research design. I had to ask

myself, “How do I fit in?” And “how do my working experiences shape to address the research?”

Qualitative methodological approaches view researchers as part of the research world, immersed in generating and interpreting data (Hammell et al, 2005). This is due to the subjective nature of the researcher’s role, which involves continuous interaction with and consideration of the data (Smith and Roberts, 2005). Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them. Interpretivists are concerned with meaning and understand persons as actors in the society in which they interpret meanings and actions in line with their own personal viewpoints (Hesse-Biber & Leavy, 2011). This is illustrated in the image below, each of the two men has his own subjective interpretation of how tall the woman is.

Image 1: Subjective Positions

Thus, as an early childhood educator with more than 15 years' experience, I have my personal experiences and interpretation of the research topic. I believe that the researcher-researched relationship fundamentally shaped the research results. For instance, one of my teaching modules, ICT integration into the early childhood curriculum, provides training for the preschool teachers in how to use technology in their teaching. That means I have already assumed that technology is positive to the children's learning. If there had been a different researcher, he or she would have had a different relationship, responding differently, asking different questions and prompting different replies. As Alvesson and Skoldberg (2000) sum up: "[t]here is no one way street between the researcher and the object of the study; rather, the two affect each other mutually and continually in the course of the research process" (p.25). The reason why I tended to use the qualitative research approach because the

process of exploring questions, collecting research data and analyzing findings is subjective and intellectually stimulating.

Qualitative research can help us to interpret and better understand the complex reality of a given situation. These methods aim to answer questions about the 'what', 'how' or 'why' of a phenomenon rather than 'how many' or 'how much', which are answered by quantitative methods (Yin, 2003, 2009). One advantage of this methodology is that the use of open-ended questions evokes responses from the participants rather than forcing them to choose from fixed answers, such as in quantitative methods. Hence, this research methodology was appropriate for exploring the perceptions and experiences of the practitioners in my study.

Some challenges throughout the process of EdD research

a. What are the differences between research questions and interview questions?

One of the key early challenges I faced was dealing with a disappointing outcome for Document 1. I met with my supervisor and she asked me a question "what are the differences between research questions and interview questions?" I could not give a good answer at that time. Then I asked myself why I could not answer this simple question. Then I kept searching and reading some related information and provided the answer to my supervisor again. Research questions are not the same as interview questions. In fact, research questions are essential because they can bring projects into

clearer focus by providing a path through the research and writing process (Shagoury & Power, 2012). However, interview questions are a method for collecting rich and detailed information to answer the research question. Research questions are usually too broad to serve as productive interview questions. Once one has research questions, one can use interview questions to help gathering credible evidence or clues that are relevant to the research questions. In my study, therefore, good and clear research questions helped me to direct the research and a set of good interview questions enabled me to answer the research questions. For example, one of the research question in my study is "what are teachers' perspectives on integrating ICT into Hong Kong preschool teaching and learning?" In order to answer this question, I designed some interview questions to gather evidence to the research question, such as "How do you think ICT supported the lesson? Please give me examples" and "How you think the curriculum, instructional strategies and technology fit together within your lesson".

a. <u>Selection of the case schools</u>

Purposive sampling (Patton, 2002) was employed in this study. This type of sampling requires access to key informants in the field who can help identify information-rich cases (Orlikowski & Baroudi, 1991). On June 2014, I sought assistance from my best friend who was a previous preschool principal and helped me to find some preschool principals to participate in my research. This selection was based on some criteria and

attributes aligned with the research questions (Merriam, 2009). However, I faced some challenges in recruiting the case schools. At first, their response was positive and they welcomed me to do focus groups and interviews. However, when I mentioned that I needed to observe their teachers, they changed their mind about joining this project. Fortunately, school principals allowed me to demonstrate to observe their teachers and students. That was demonstrated to me that selecting the cases is not easy and good networking is very important.

c. Focus group experiences

I found the focus group was challenge because I knew that I only had one chance to gather teachers' views in each school. Thus, I had to design the focus group questions well so that I could gather data which would help me answer my research questions. With regard to content, my two supervisors gave me more valuable suggestions on setting the interview questions. Anderson (1990) offers some guidelines for constructing the questions for focus groups that I followed. For example, questions must be of "qualitative nature" and open ended and should be sequenced in such a way that they flow naturally be questions that have a possible 'yes' or 'no' answers should be avoided. Before the research focus groups took

place, I practiced asking well-phrased and clear questions of some of my students and they made suggestions about how I could improve the interview questions. As Daniel (2010) indicated that the pilot test will assist the researchers with the refinement of research questions. Creating effective research questions for the interview process is one of the most crucial components to interview design. It will also assist the research in determining if there are flaws, limitations, or other weaknesses with the interview design and will allow them to make necessary revisions prior to the implementation of the study (Kvale, 2007). Thus, the pilot of the interview questions was important to my research. I was able to ensure that each question would allow me to dig dip into the experiences and knowledge of the preschool teachers in order to gain maximum data from the focus group interviews.

Moreover, during the focus group interview, I recorded all my focus groups using a digital voice recorder and a camcorder. I also used my mobile phone to record as a backup. Fortunately, nothing went wrong and I also got some unexpected data throughout the discussion. Focus group is a valuable research instrument to provide "a rich a detailed set of data about perceptions, thoughts, feelings and impressions of people in their own words" (Stewart & Shamdasani, 1990, p.140). I felt extremely privileged and humbled that teachers were so willing to give me their time and share their thoughts and teaching experiences. It

was important to acquire participants who were willing to openly and honestly share information or “their story” (p.133). Besides, as the venue of the focus group was the meeting room of these two case schools, it was easier to conduct the interviews with participants in a comfortable environment where the participants did not feel restricted or uncomfortable to share information (Creswell, 2007).

Image 2: Focus group discussion in Kindergarten A

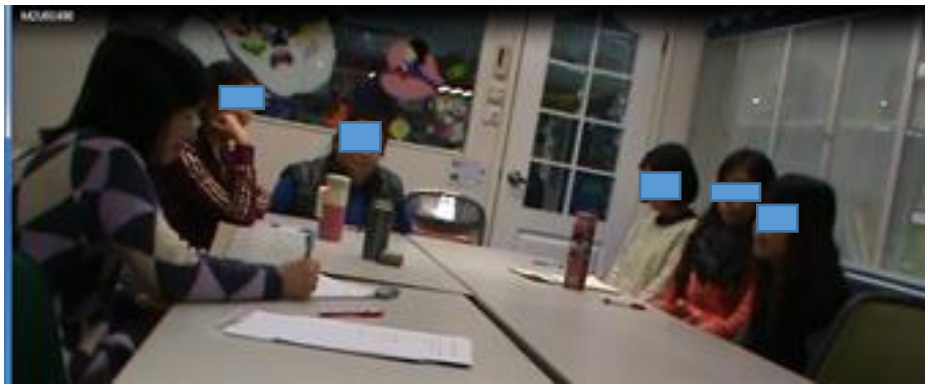


Image 3: Focus group discussion in Kindergarten B

d. Development of conceptual framework of my research

The conceptual framework is a researcher's map of the territory being investigated and encompasses the broad ideas and principles from a field of inquiry that structure and scaffold the study, and thereby assisting a researcher in drawing meaning from findings (Smyth, 2004). Nevertheless, it was difficult for me to think about a conceptual framework fit for my research for almost 3 months. During that time, I read many journal articles but I could not find a suitable framework for my research since there are very few studies on the integration of ICT in preschool settings. Hence, I decided to join some research sharing sessions and seminars in my institute. One day, I attended a workshop on the topic of "reflexivity on my EdD research journey", facilitated by Ms Annie Wu, a colleague and doctoral candidate at The University of Hong Kong. Importantly, this workshop inspired me so much in relation to using the conceptual framework of Technological Pedagogical Content Knowledge (TPACK model) in my study. The TPACK is a clear model for teachers to integrate technology into their curriculum and thus if I could have positive findings in my study, then they would contribute to the field of early childhood education. From this experience, I found that the numerous interpersonal encounters and discussions with staff and colleagues throughout my study had a profound impact on me. For example, I had clearer concept on the differences between a theoretical framework and conceptual framework. According to

Leshem (2007), social interaction and social learning can lead to cognitive development through collective problem solving. After interaction with colleagues, I am becoming more skilled and increasing my confidence in research and reflecting rigorously on it.

e. The struggle with qualitative or mixed approaches

Another problem I encountered was changing the research methodology. In phase two of my study, I was facing the very difficult issue of setting an observation guide. Originally, I wanted to use an observation guide developed by another researcher. However, my supervisors pointed out that these observation guides belong to the quantitative approach, so I should change my research methodology to a mixed approach. As Babbie (1995) contends. "the best study design is one that uses more than one research method, taking advantage of their different strengths" (p, 103). Even though the use of both qualitative and quantitative research methods gives the researcher a better understanding of the nature of research questions in the study, to me, it seemed impossible to make the transition from the qualitative paradigm to a quantitative one, because I have numbers anxiety. That means I am easily confused by anything numerical. Wider reading of both textbooks and relevant journals and communication with some experts on the quantitative approach could not help me change my mind. I felt trapped and there seemed to be no light at the end of the tunnel. Nevertheless,

one day, I told my colleague about that problem and she told me she had also been in the same situation previously. Her supervisor advised her to consider gathering evidence during the observation. This conversation gave me some tips on my observation guide. Conducting qualitative research and writing was suitable for my research because qualitative studies focus on interpretative analysis of texts and investigate a research problem in depth (Bernard, 2002). Qualitative research emerged from social constructivist epistemology, in which "the researchers are interested in understanding the meaning people have constructed,…how they make sense of their world and the experiences they have in the world" (Merriam, 1998,p.6). Finally, I could develop an observation guide which would fit my qualitative research approach.

f. What is my data analysis plan?

Like other EdD students coming to qualitative research for the first time, we were overwhelmed by the amounts of data we generated. I employed thematic analysis to analyse data because it is straightforward and user friendly for students and novices to qualitative methods (Braun and Clarke, 2006). In addition, it is a common form of analysis in qualitative research. Thematic analysis is a method for "identifying, analyzing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p.79). Indeed, it is a simple categorizing

strategy for qualitative data. It is straightforward and user friendly for the novice users of qualitative methods (Braun and Clarke, 2006). So I followed the steps by Braun and Clarke (2006 & 2013) in thematic analysis. Then I read and read the data, made notes and began to sort it into categories. It was important to immerse myself in all the gathered data to familiarize myself with it. It helped me to move from a broad reading of the data towards discovering patterns and developing themes. Thus, roles of teacher in ICT, ways of using ICT in classroom, barriers of ICT usage in preschool, trend of ICT using in early childhood education, in total six themes were identified in my data.

g. Academic writing is just tough

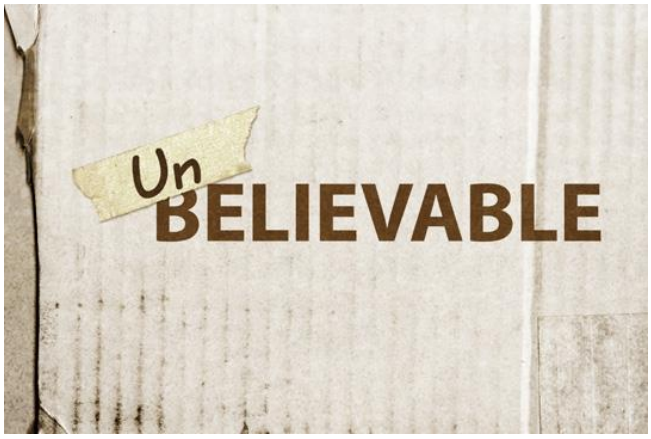
On reflection, the academic writing process was extremely difficult. I spent an uncountable number of hours writing my thesis. Nonetheless, I had some tips on this aspect. At first, I found that it was important to keep the main thesis and research questions in focus when writing the different parts of my research because this could help me to avoid getting sidetracked. Thus, I always reminded myself to keep looking at the writing and ask myself 'does that provide on answer to the research questions?' Secondly, it is important to have time to think alone and work alone, but there should also be time to share thoughts with other people. Then I could have a more clear and detailed picture of my research. Thirdly,

keeping writing every day is vital because writing is a pretty difficult and time consuming process for me. I found it took longer than expected to submit each document, partly due to the fact that I should have allowed more time for proof-reading. Moreover, I needed much time checking and searching for missing references. Fourthly, good organizational skills are required to write a good thesis because organizing my views, data, and evidence in a logical order was not so easy. In my thesis, I tried to overcome the organizational problem by answering the research questions throughout the whole academic text. Fifthly, I did not delete some points that I might not end up keeping in the thesis. I like to keep those points in a separate file and return to them later. Such ideas might be useful in my next academic piece of writing. Sixth, when editing the research, I tried to note thoughts and concepts in any way I wish -- bullet points, single words, short sentences or paragraphs. I think one should not worry about writing academically or about whether it makes sense at the beginning. These will help as vital cues for organizing and editing the whole writing.

h. The Mock viva preparation experience

The mock viva preparation was the most challenging phase for me. Nonetheless, I think it provided me with the opportunity to read the whole thesis again and explore some viva strategies at that stage. When I saw my name in the mock viva list, I felt incredulous and

excited because that meant I had almost achieved my task to finish my research. I read the list twice to check if that was right.



I searched for some information about how to deal with the viva voce examination. I found the following document from the internet which was useful for me. http://www.cse.chalmers.se/~feldt/advice/twigg_preparing_for_phd_viva.pdf

It mentions that we should not think of the exact questions the examiners would ask but it is better to prepare myself for anything about my study. For instance, what have I done? How and why did I do this? What did I do? What are the implications of my research? I tried to follow the guidance in this article to prepare for my mock viva.

Moreover, some points were really useful when I prepared my viva. First, I read my thesis page by page and that was the first time since submission. I found some typos and

grammatical errors in it. Besides, through speaking with my colleagues and friends who are fellow EdD students, I received some instruction on the viva voce questions that would be raised in the mock or actual viva voce examination. For example, what motivated and inspired you to carry out this research? What are the contributions to knowledge of your thesis, what are the limitations of your thesis? In fact, I absolutely understand that unexpected and unanticipated questions will arise. Finally, according to hints about how to handle difficult situations in your dissertation defense by Butin (2010), talking to the chair and committee members before the dissertation defense is important because they can foresee any major problems. Therefore it was useful to clarify some potential problems during a mock viva. Some potential questions were asked and I learnt how to be best address these. I felt it was a really helpful and positive experience for me before I did the viva examination.

i. Attending and sharing at an academic conference

The most accessible way for doctoral students to get recognition for their contribution is through a conference presentation, even if they just co-author a paper or poster being presented at conference. Therefore, I tried to participate in some academic conferences. Some questions had come to my mind in the past. Can I just present my literature review or

theoretical framework? Do I have anything worthy to be presented? Or should I wait until I have findings from my study? I applied for a conference grant and sent the form to my previous head of department Professor Susan Grieshaber and told her my worries about it. Then she explained to me patiently that all the research ideas, theoretical framework and literatures are welcomed to be presented in the conference. And she encouraged me to try for the poster presentation the first time to get some experience. In fact, I knew very little about how to prepare the poster presentation. Luckily, I revised once after I received from Prof Grieshaber. She was more supportive, but still let me use my own ideas in the final version of the poster.

I took Prof Grieshaber's suggestion and participated in The International Symposium on Education, Psychology, Society and Tourism conference (ISEPST 2014) (from March 28 to 30 in 2014) in Japan Tokyo. By attending the other presenters' presentation, I learned more from them and improved my skills and knowledge about my field. For example, I learned it is hard to capture the research within a 20 minute presentation. I felt happy and grateful that I could share my experience and vision of my study with others. Moreover, it really positively influenced the direction of my study since such experience had provided me with confidence, knowledge and understanding to undertake my own research and also to critically evaluate the research of others in order to better inform my own professional practice through the academic exchange in the conference.

Surprisingly, after coming back to Hong Kong, I received an email from Prof Grieshaber and she encouraged me to present my research ideas in our departmental meeting. She said it would be a very good experience for me to gather the other early childhood experts' advice through this opportunity. Then I accepted and shared my work with my colleagues. As Wenger (1998) suggested that learning is a natural and inevitable aspect of life, and fundamentally a social process. Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact

regularly (Wenger, 2011). My colleagues were very supportive and asked me some questions that prompted me to think deeply about my research design, such as what are the boundaries for your investigation? What is your conceptual framework and its role in your thesis?

Concluding comments

In retrospect, even though studying for on EdD is a lonely process, it contributed significantly to my professional development. This included the management of time, documentary resources, analysis of reports, gathered data. It also gave me opportunities to contact some preschools which could increase my knowledge about the field of early childhood education. Through reflexivity, I am not only reflecting on my thoughts but also thinking about factors that influence the way I think, and accordingly altering the way I reach decisions (Johnson and Duberley, 2003; Anderson, 2008). Past experience helped me become more skillful and confident about doing research in the future. I also want to say thank you to my two advisors, Dr Tina Byrom and Dr Ruth Richards, they were always nice, encouraging and supportive. Indeed, having to earn a living, run my own home and deal with family commitments are all difficulties for EdD student to find time to study. I was feeling stressed about the lack of available time for my study. However, now I am quite

happy that I am working on a piece of research that will contribute to the existing knowledge of early childhood education. These are the words that I can share with new EdD students: Believe in yourself! Keep going and you'll get there in the end! Never give up!

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